

VSB ENGINEERING COLLEGE
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
EC6501 -DIGITAL COMMUNICATION
(2 Marks Questions with Answers and 16 Marks)

UNIT-I

SAMPLING & QUANTIZATION

1. Define Dirac comb or ideal sampling function. What is its Fourier Transform?

Dirac comb is nothing but a periodic impulse train in which the impulses are spaced by a time interval of T_s seconds. The equation for the function is given

by

$$\delta_{T_s}(t) = \sum_{n=-\infty}^{\infty} \delta(t - n T_s)$$

The Fourier Transform of $\delta_{T_s}(t)$ is given by

$$F[\delta_{T_s}(t)] = f_s \sum_{m=-\infty}^{\infty} \delta(f - m f_s)$$

2. Give the interpolation formula for the reconstruction of the original signal.

The interpolation formula for the reconstruction of the original signal $g(t)$ from the sequence of sample values $\{g(n/2W)\}$.

$$g(t) = \sum_{n=-\infty}^{\infty} g(n/2W) \text{sinc}(2Wt - n)$$

where $2W$ is the bandwidth
 n is the number of samples.

3. State sampling theorem. (Madras Univ., Nov-97, Oct-98, Dec-06, 08, 09, May-07, 09, 12)

- ¾ If a finite –energy signal $g(t)$ contains no frequencies higher than W hertz ,it is completely determined by specifying its co=ordinates at a sequence of points spaced $1/2W$ seconds apart.
- ¾ If a finite energy signal $g(t)$ contains no frequencies higher than W hertz, it may be completely recovered from its co=ordinates at a sequence of points spaced $1/2W$ seconds apart.
- ¾ A band limited signal of finite energy, which has no frequency components higher than W Hz, may be completely recovered from the knowledge of its samples taken at the rate of $2W$ samples per second.

4. Define quadrature sampling.

Quadrature sampling is used for uniform sampling of band pass signals.

Consider $g(t) = g_1(t) \cos(2\pi f_c t) - g_2(t) \sin(2\pi f_c t)$.

5. Define Nyquist rate. (Madras Univ, April-97)

Let the signal be band limited to W Hz. Then Nyquist rate is given as,

Nyquist rate = $2W$ samples/sec

Aliasing will not take place if sampling rate is greater than Nyquist rate.

6. What is meant by aliasing effect? (Madras Univ, April-97, Dec-05)

$\frac{3}{4}$ Aliasing effect takes place when sampling frequency is less than Nyquist rate. Under such condition, the spectrum of the sampled signal overlaps with itself. Hence higher frequencies take the form of lower frequencies. This interference of the frequency components is called as aliasing effect.

$\frac{3}{4}$ A band limited signal of finite energy, which has no frequency components higher than W Hz, may be completely recovered from the knowledge of its samples taken at the rate of $2W$ samples per second.

7. What is meant by PCM?

Pulse code modulation (PCM) is a method of signal coding in which the message signal is sampled, the amplitude of each sample is rounded off to the nearest one of a finite set of discrete levels and encoded so that both time and amplitude are represented in discrete form.. This allows the message to be transmitted by means of a digital waveform.

8. What are the two fold effects of quantizing process?

1. The peak-to-peak range of input sample values subdivided into a finite set of decision levels or decision thresholds
2. The output is assigned a discrete value selected from a finite set of representation levels are reconstruction values that are aligned with the treads of the staircase.

9. What is meant by idle channel noise?

Idle channel noise is the coding noise measured at the receiver output with zero transmitter input.

10. What is meant by prediction error?

The difference between the actual sample of the process at the time of interest and the predictor output is called a prediction error.

11. Define delta modulation.

Delta modulation is the one-bit version of differential pulse code modulation.

12. Define adaptive delta modulation.

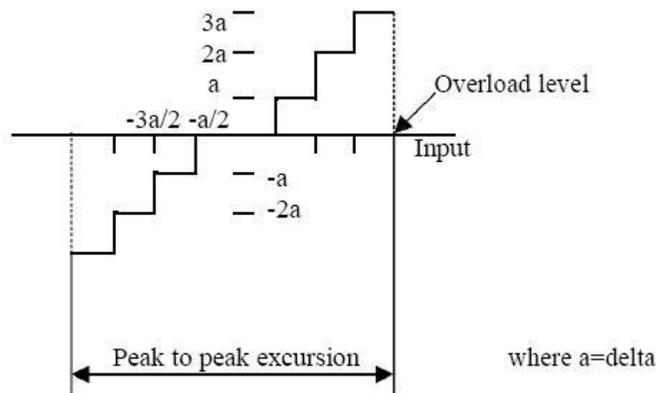
The performance of a delta modulator can be improved significantly by making the step size of the modulator assume a time- varying form. In particular, during a steep segment of the input signal the step size is increased. Conversely, when the input signal is varying slowly, the step is reduced, In this way, the step size is adapting to the level of the signal. The resulting method is called adaptive delta modulation (ADM).

13. Name the types of uniform quantizer?

1. Mid tread type quantizer.
2. mid riser type quantizer.

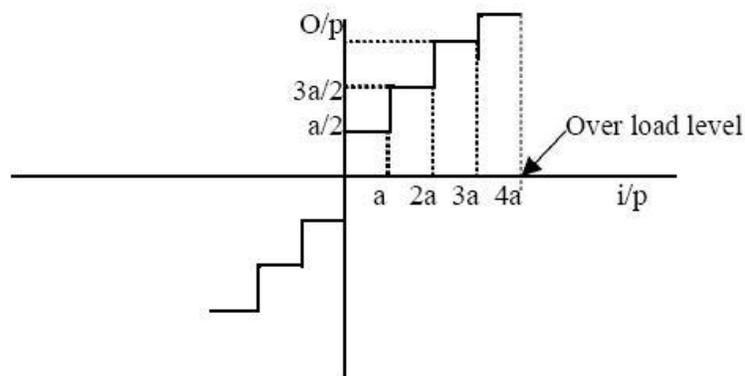
14. Define mid tread quantizer?

Origin of the signal lies in the middle of a tread of the staircase.



15. Define mid-riser quantizer?

Origin of the signal lies in the middle of a rise of the staircase



16. What is meant by quantization? (May-12)

While converting the signal value from analog to digital, quantization is performed. The analog value is assigned to nearest digital value. This is called quantization. The quantized value is then converted into equivalent binary value. The quantization levels are fixed depending upon the number of bits. Quantization is performed in every Analog to Digital Conversion.

17. The signal to quantization noise ratio in a PCM system depends on what criteria? (MAY-06)

The signal to quantization noise ratio in PCM is given as,

$$(S/N)_{db} \leq (4.8 + 6v) dB$$

Here v is the number of bits used to represent samples in PCM. Hence signal to quantization noise ratio in PCM depends upon the number of bits or quantization levels.

18. Define quantization error? (May-07)

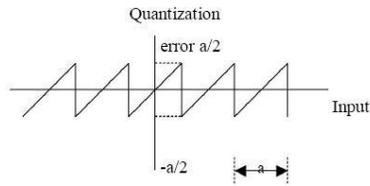
Quantization error is the difference between the output and input values of quantizer.

19. What you mean by non-uniform quantization? (May-08)

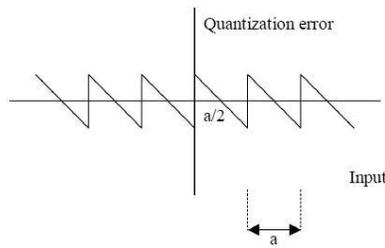
Step size is not uniform. Non-uniform quantizer is characterized by a step size that increases as the separation from the origin of the transfer characteristics is increased. Non-uniform quantization is otherwise called as robust quantization. .

20. Draw the quantization error for the mid tread and mid-rise type of quantizer?

For mid tread type:



For mid riser type:



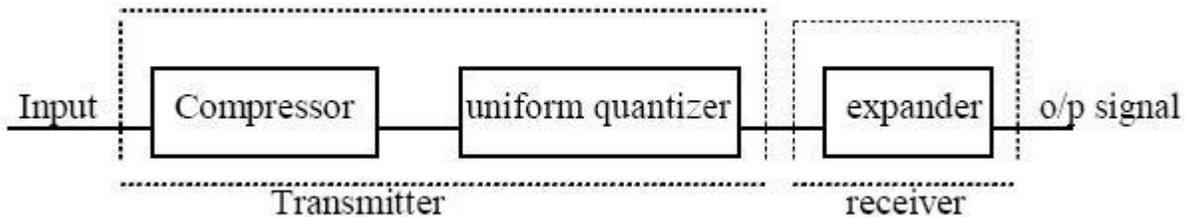
21. What is the disadvantage of uniform quantization over the non-uniform quantization?

SNR decreases with decrease in input power level at the uniform quantizer but non-uniform quantization maintains a constant SNR for wide range of input power levels. This type of quantization is called as robust quantization.

22. What do you mean by companding?

The signal is compressed at the transmitter and expanded at the receiver. This is called as companding. The combination of a compressor and expander is called a compander.

23. Draw the block diagram of compander? Mention the types of companding? Block diagram:



Types of companding:

1. A-law companding.
2. μ -law companding.

Part B

1. Explain the generation of PPM and PWM with neat circuit diagram. (8)
2. Compare DM with ADM and explain linear prediction filter. (16)
3. Explain the block diagram of digital communication system (10)
4. Explain Gram Schmidt orthogonalisation procedure (16)
5. Explain any three communication channel models (12)

UNIT-II
WAVEFORM CODING

1. What is PAM?

PAM is the pulse amplitude modulation. In pulse amplitude modulation, the amplitude of a carrier consisting of a periodic train of rectangular pulses is varied in proportion to sample values of a message signal.

2. What is the need for speech coding at low bit rates?

The use of PCM at the standard rate of 64 Kbps demands a high channel bandwidth for its transmission, so for certain applications, bandwidth is at premium, in which case there is a definite need for speech coding at low bit rates, while maintaining acceptable fidelity or quality of reproduction.

3. Define ADPCM.(Oct-98)

It means adaptive differential pulse code modulation, a combination of adaptive quantization and adaptive prediction. Adaptive quantization refers to a quantizer that operates with a time varying step size. The autocorrelation function and power spectral density of speech signals are time varying functions of the respective variables. Predictors for such input should be time varying. So adaptive predictors are used.

4. What is meant by forward and backward estimation?

$\frac{3}{4}$ **AQF:** Adaptive quantization with forward estimation. Unquantized samples of the input signal are used to derive the forward estimates.

$\frac{3}{4}$ **AQB:** Adaptive quantization with backward estimation. Samples of the quantizer output are used to derive the backward estimates.

$\frac{3}{4}$ **APF:** Adaptive prediction with forward estimation, in which Unquantized samples of the input signal are used to derive the forward estimates of the predictor coefficients.

$\frac{3}{4}$ **APB:** Adaptive prediction with backward estimation, in which Samples of the quantizer output and the prediction error are used to derive estimates of the predictor coefficients.

5. What are the limitations of forward estimation with backward estimation?

$\frac{3}{4}$ Side information

$\frac{3}{4}$ Buffering

$\frac{3}{4}$ Delay

6. How are the predictor coefficients determined?

For the adaptation of the predictor coefficients the least mean square (LMS) algorithm is used.

7. Define adaptive sub band coding? (Nov-97)

It is a frequency domain coder, in which the speech signal is divided into number of subbands and each one is coded separately. It uses non masking phenomenon in perception for a better speech quality. The noise shaping is done by the adaptive bit assignment.

8. What are formant frequencies?

In the context of speech production the formant frequencies are the resonant frequencies of the vocal tract tube. The formants depend on the shape and dimensions of the vocal tract.

9. What is the bit rate in ASBC?

$Nfs = (MN) (fs/M)$ Nfs->bit rate

Where

M-number of sub bands of equal bandwidths

N-average number of bits

Fs/M-sampling rate for each sub band.

10. Define Adaptive filter.

It is a nonlinear estimator that provides an estimate of some desired response without requiring knowledge of correlation functions, where the filter coefficients are data dependent. A popular filtering algorithm is the LMS algorithm.

11. Define data signaling Rate.

Data signaling rate is defined as the rate measured in terms bits per second (b/s) at which data are transmitted.

Data signaling rate $R_b = 1/T_b$ Where T_b =bit duration.

12. Mention the merits of DPCM.

1. Bandwidth requirement of DPCM is less compared to PCM.
2. Quantization error is reduced because of prediction filter
3. Numbers of bits used to represent one sample value are also reduced compared to PCM.

13. What is the main difference in DPCM and DM?

DM encodes the input sample by one bit. It sends the information about $+\delta$ or $-\delta$, i.e. step rise or fall. DPCM can have more than one bit of encoding the sample. It sends the information about difference between actual sample value and the predicted sample value.

14. How the message can be recovered from PAM?

The message can be recovered from PAM by passing the PAM signal through reconstruction filter integrates amplitude of PAM pulses. Amplitude reconstruction signal is done to remove amplitude discontinuities due to pulses.

15. Write an expression for bandwidth of binary PCM with N messages each with a maximum frequency of f_m Hz.

If „v“ number of bits are used to code each input sample, then bandwidth of PCM is given as,

$BT \geq N.v.f_m$.Here $v.f_m$ is the bandwidth required by one message.

16. How is PDM wave converted into PPM message?

The PDM signal is clock signal to monostable multivibrator. The multivibrator triggers on falling edge. Hence a PPM pulse of fixed width is produced after falling edge of PDM pulse. PDM represents the input signal amplitude in the form of width of the pulse. A PPM pulse is produced after the width of PDM pulse. In other words, the position of the PPM pulse depends upon input signal amplitude.

17. Mention the use of adaptive quantizer in adaptive digital waveform coding schemes.

Adaptive quantizers change its step size according variance of the input signal. Hence quantization error is significantly reduced due to the adaptive quantization. ADPCM uses adaptive quantization. The bit rate of such schemes is reduced due to adaptive quantization.

18. What do you understand from adaptive coding?

In adaptive coding, the quantization step size and prediction filter coefficients are changed as per properties of input signal. This reduces the quantization error and number of bits to represent the sample value. Adaptive coding is used for speech coding at low bits rates.

19. What is meant by adaptive delta modulation?

In adaptive delta modulation, the step size is adjusted as per the slope of the input signal. Step size is made high if slope of the input signal is high. This avoids slope overload distortion.

20. What is the advantage of delta modulation over pulse modulation schemes?

Delta modulation encodes one bit per samples. Hence signaling rate is reduced in DM.

21. What is the advantage of delta modulation over PCM?

Delta modulation uses one bit to encode on sample. Hence bit rate of delta modulation is low compared to PCM.

22. What are the two limitations of delta modulation?

1. Slope of overload distortion.
2. Granular noise.

23. How does Granular noise occurs?

It occurs due to large step size and very small amplitude variation in the input signal.

24. What are the advantages of the Delta modulation?

1. Delta modulation transmits only one bit for one sample. Thus the signaling rate and transmission channel bandwidth is quite small for delta modulation.
2. The transmitter and receiver implementation is very much simple for delta modulation. There is no analog to digital converter involved in delta modulation.

Part B

1. Explain a DPCM system. Derive the expression for slope overload noise of a system (16)
2. Explain sub band coding (8)
3. Compare the performance of various speech encoding methods. (8)
4. State the Nyquist sampling theorem. Demonstrate its validity for an analog signal $x(t)$ having a fourier transform $x(f)$ which is zero outside the interval $-f_m < f < +f_m$ (16)
5. Write short notes on temporal waveform coding (8)
6. Explain a non uniform quantization process (8)

UNIT III

BASEBAND TRANSMISSION

1. What is inter symbol interference in baseband binary PAM systems?

In baseband binary PAM, symbols are transmitted one after another. These symbols are separated by sufficient time durations. The transmitter, channel and receiver acts as a filter to this baseband data. Because of the filtering characteristics, transmitted PAM pulses are spread in time.

2. What are eye pattern?

Eye pattern is used to study the effect of ISI in baseband transmission.

1. Width of eye opening defines the interval over which the received wave can be sampled without error from ISI.
2. The sensitivity of the system to timing error is determined by the rate of closure of the eye as the sampling time is varied.
3. Height of the eye opening at sampling time is called margin over noise.

3. How is eye pattern obtained on the CRO?

Eye pattern can be obtained on CRO by applying the signal to one of the input channels and given an external trigger of $1/Tb$ Hz. This makes one sweep of beam equal to Tb seconds.

4. What is correlative coding?

Correlative level coding is used to transmit a baseband signal with the signaling rate of $2B_0$ over the channel of bandwidth B_0 . This is made physically possible by allowing ISI in the transmitted in controlled manner. This ISI is known to receiver. The correlative coding is implemented by duo binary signaling and modified duo binary signaling.

5. Define Duo binary baseband PAM system.

Duo binary encoding reduces the maximum frequency of the baseband signal. The word duo means to double the transmission capacity of the binary system. Let the PAM signal a_k represents k^{th} bit. Then the encoder the new waveform as

$$C_k = a_k + a_{k-1}$$

Thus two successive bits are added to get encoded value of the k^{th} bit. Hence C_k becomes a correlated signal even though a_k is not correlated. This introduces intersymbol interference in the controlled manner to reduce the bandwidth.

6. What are the three broad types of synchronization?

1. Carrier synchronization
2. Symbol & Bit synchronization
3. Frame synchronization.

7. What is carrier synchronization?

The carrier synchronization is required in coherent detection methods to generate a coherent reference at the receiver. In this method the data bearing signal is modulated on the carrier in such a way that the power spectrum of the modulated carrier signal contains a discrete component at the carrier frequency.

8. What are the two methods for carrier synchronization?

1. Carrier synchronization using Mth Power loop
2. Costas loop for carrier synchronization

9. What it is called symbol or bit synchronization?

In a matched filter or correlation receiver, the incoming signal is sampled at the end of one bit or symbol duration. Therefore the receiver has to know the instants of time at which a symbol or bit is transmitted. That is the instants at which a particular bit or symbol status and when it is ended. The estimation of these times of bit or symbol is called symbol or bit synchronization.

10. What are the two methods used in bit and symbol synchronization?

- 1) Closed loop bit synchronization
- 2) Early late gate synchronizer

11. What are the disadvantages of closed loop bit synchronization?

- 1) If there is a long string of 1's and 0's then $y(t)$ has no zero crossings and synchronization may be lost.
- 2) If zero crossing of $y(t)$ are not placed at integer multiples of T_b , the synchronization suffers from timing Jitter.

12. What it is called frame synchronization?

Depending on bits used for encoding, the word length is defined. Thus each word container some fixed number of bits. The receiver has to know when a particular frame status and when its individual message bits status. This type of synchronization is called frame synchronization.

13. Why synchronization is required?

The signals from various sources are transmitted on the single channel by multiplexing. This requires synchronization between transmitter and receiver. Special synchronization bits are added in the transmitted signal for the purpose. Synchronization is also required for detectors to recover the digital data properly from the modulated signal.

14. Why do you need adaptive equalization in a switched telephone network?

In switched telephone network the distortion depends upon

1. Transmission characteristics of individual links.
2. Number of links in connection.

Hence fixed pair of transmit and receive filters will not serve the equalization problem. The transmission characteristics keep on changing. Therefore adaptive equalization is used.

15. Define the principle of adaptive equalization.

(Dec-08)

The filters adapt themselves to the dispersive effects of the channel that is .the coefficients of the filters are changed continuously according to the received data. The filter coefficients are changed in such a way that the distortion in the data is reduced

16. Define duo binary encoding.

Duo binary encoding reduces the maximum frequency of the base band signal the “word duo” means to the double transmission capacity of the binary system

17. Write a note on correlative level coding.

Correlative level coding allows the signal scaling rate of $2B_0$ in the channel of bandwidth B_0 . This is made physically possible by allowing ISI in the transmitted signal in controlled manner this ISI is known to the receiver.

18. Define the term ISI.

(Dec-10)

The presence of outputs due to other bits interference with the output of required bit .This effect is called inter symbol interference (ISI)

19. Write the performance of data transmission system using eye pattern technique.

The width of the eye opening defines the interval over which the received wave can be sampled without error from inter symbol interference. The sensitivity of the system to timing error is determined by the rate of closure of the eye as the sampling time is varied

20. What is the necessity of equalization?

When the signal is passed through the channel distortion is introduced in terms of

- 1) Amplitude
- 2) Delay this distortion creates problem of ISI. The detection of the signal also becomes difficult this distraction can be compensated with the help of equalizer.

21. What is matched filter?

(May-09)

The matched filter is a baseband signal receiver, which works in presence of white Gaussian noise. The impulse response of the matched filter is matched to the shape of the input signal.

22. Why do we need equalization in base band transmission?

(May-07, Dec-08)

When the signal is passed through the channel, distortion is introduced in terms
of i) Amplitude. ii) Delay.

This distortion creates of ISI.The detection of the signal also becomes difficult. This distortion can be compensated with the help of equalizers. Equalizers are basically filters which connect the channel distortion.

23. List the primary causes for the noise in communication system.

(DEC-11)

- i) Band limited nature of the channel.
- ii) Environmental effects such as lighting, humidity, temperature etc.
- iii) EMI and RFI
- iv) Thermal noise due to electronic components.

24. Define modulation rate.

It is defined as the rate at which signal level is changed depending On the nature of the format used to represent the digital data. It is measured in Bauds or symbols per second.

25. State NRZ Unipolar format.

In this format binary 0 is represent by no pulse and binary 1 is represented by the positive pulse.

26. State NRZ polar format.

Binary 1 is represented by a positive pulse and binary 0 is represented by a Negative pulse.

27. State NRZ bipolar format.

Binary 0 is represented by no pulse and binary one is repre nted by the alternative p sitive and negative pulse.

28. State Manchester format.

Binary 0 Æ The first half bit duration negative pulse and the second half Bit duration positive pulse.

Binary 1Æ first half bit duration positive pulse and the second half Bit duration negative pulse.

Part B

1. Explain tree diagram, trellis diagram and state transition diagram of convolutional codes.(6)
2. Explain how encoding is done by convolutional codes with a suitable example. (10)
3. Derive the expression for power spectral density for unipolar NRZ code and hence discuss its
4. characteristics (16)
5. 4.Design a block code for message block of size eight that can correct for single errors.(6)
6. Design a convolutional coder of constraint length 6 and rate efficiency $\frac{1}{2}$.Draw its tree diagram and trellis diagram.(10)
7. Assume a (2,1) convolutional coder with constraint length 6.Draw the tree diagram, state diagram and trellis diagram for the assumed coder. (9)
8. Find the (7,4) linear systematic block code word corresponding to 1101. Assume a suitable generator matrix. (7)
9. Briefly explain the concept of error free communication.

UNIT –IV

DIGITAL MODULATION SCHEME

1. Mention the need of optimum transmitting and receiving filter in baseband data transmission.

(Madras Univ, April97, Nov-97)

When binary data is transmitted over the baseband channel, noise interfaces with it. Because of this noise interference, errors are introduced in signal detection. Optimum filter performs two functions while receiving the noisy signal:

- 1) Optimum filter integrates the signal during the bit interval and checks the output at the time instant where signal to noise ratio is maximum
- 2) Transfer function of the optimum filter is selected so as to maximize signal to noise ratio.
- 3) Optimum filter minimizes the probability of error.

2. Define ASK.

(Madras Univ, April-97,98)

In ASK, carrier is switched on when binary 1 is to be transmitted and it is switched off when binary D is to be transmitted ASK is also called on-off keying.

3. What is meant by DPSK?

(Madras Univ, April-98)

In DPSK, the input sequence is modified. Let input sequence be $d(t)$ and output sequence be $b(t)$. Sequence $b(t)$ changes level at the beginning of each interval in which $d(t)=1$ and it does not change level when $d(t)=0$. When $b(t)$ changes level, phase of the carrier is changed. And as stated above, $b(t)$ changes its level only when $d(t) = 1$. This means phase of the carrier is changed only if $d(t)=1$. Hence the technique is called Differential PSK.

4. Explain coherent detection?

(Madras Univ, Nov-97, May-04)

In coherent detection, the local carrier generated at the receiver is phase locked with the carrier at the transmitter. The detection is done by correlating received noisy signal and locally generated carrier. The coherent detection is a synchronous detection.

5. What is the difference between PSK and FSK?

(Madras Univ, April-97)

In PSK, phase of the carrier is switched according to input bit sequence. In FSK frequency of the carrier is switched according to input bit sequence. FSK needs double of the bandwidth of PSK.

6. What is meant by coherent ASK?

(Madras Univ, Oct-98)

In coherent ASK, correlation receiver is used to detect the signal. Locally generated carrier is correlated with incoming ASK signal. The locally generated carrier is in exact phase with the transmitted carrier. Coherent ASK is also called as synchronous ASK.

7. What is the advantage of coherent PSK over coherent ASK?

(Madras Univ, Oct-98)

ASK is on-off signalling, whereas the modulated carrier is continuously transmitted in PSK. Hence peak power requirement is more ASK, whereas it is reduced in case of PSK.

8. Explain the model of band pass digital data transmission system?

The band pass digital data transmission system consists of source, encoder and modulator in the transmitter. Similarly receiver, decoder and destination form the transmitter.

9. What is baseband signal receiver?

A baseband signal receiver increases the signal to noise ratio at the instant of sampling. This reduces the probability of error. The baseband signal receiver is also called optimum receiver.

10. What is matched filter?

The matched filter is a baseband signal receiver, which works in presence of white Gaussian noise. The impulse response of the matched response of the matched filter is matched to the shape of the input signal.

11. What is the value of maximum signal to noise ratio of the matched filter? When it becomes maximum?

Maximum signal to noise ratio is the ratio of energy to PSD of white noise.

$$\text{i.e., } \rho_{\max} = E / (N_0/2)$$

This maximum value occurs at the end of bit duration i.e. T_b .

12. What is correlator?

Correlator is the coherent receiver. It correlates the received noisy signal $f(t)$ with the locally generated replica of the unknown signal $x(t)$. Its output is denoted as $r(t)$.

13. On what factor, the error probability of matched filter depends.

Error probability is given as

$$P_e = 1/2 \operatorname{erfc} \sqrt{E/N_0}$$

This equation shows that error probability depends only on energy but not on shape of the signal.

14. Bring out the difference between coherent & non coherent binary modulation scheme.

(May-05,07,09,Dec-08,09)

a. Coherent detection:

In this method the local carrier generated at the receiver is phase locked with the carrier at the transmitter.

Hence it is called synchronous detection

b. Non coherent detection:

In this method, the receiver carrier need not be phase locked with transmitter carrier. Hence it is called envelope detection.

15. Write the expression for bit error rate for coherent binary FSK.

Bit error rate for coherent binary FSK is given as,

$$P_e = 1/2 \operatorname{erfc} \sqrt{0.6E/N_0}$$

16. Highlight the major difference between a QPSK & MSK signal. (Dec-05)

MSK signal have continuous phase in all the cases, where as QPSK has phase shift of $\pi/2$ or π .

17. What is the error probability of MSK & DPSK? (May-06)

Error probability of MSK: $P_e = 1/2 \operatorname{erfc} \sqrt{E/N_0}$

Error probability of DPSK: $P_e = 1/2 e^{-E_b/N_0}$

18. In minimum shift keying what is the relation between the signal frequencies & bit rate.

Let the bit rate be f_b and the frequency of carrier be f_0 . The higher and lower MSK signal frequencies are given as,

$$f_H = f_0 + f_b/4$$

$$f_L = f_0 - f_b/4$$

19. List the advantages of Pass band

transmission. a. Long distance.

b. Analog channels can be used for transmission.

c. Multiplexing techniques can be used for bandwidth conservation. d. Transmission can be done by using wireless channel also.

20. List the requirements of Pass band transmission.

a. Maximum data transmission rate.

b. Minimum probability of symbol error.

c. Minimum transmitted power.

21. What is signal constellation diagram?

(Dec-08)

The signal constellation diagram is similar to the phasor diagram but the entire phasor is not drawn. The signal constellation diagram shows only relative positions of the peaks of the phasors. The signal constellation diagram is also called state space diagram.

22. Define QPSK.

(Dec-09)

- x QPSK is Quadriphase –shift keying. In QPSK the phase of the carrier takes on one of the four equally spaced values Such as $-\pi/4$, $3\pi/4$, $5\pi/4$ and $7\pi/4$.
- x In QPSK two successive bits in the data sequence are grouped together. This combination of two bits forms four distinct symbols. When symbols are changed to next symbol the phase of the carrier is changed by 45° .

23. What is meant by memory less modulation?

When the digital symbol modulates amplitude, Phase or frequency of the carrier without any reference to provide symbol, it is called memory less modulation. ASK, FSK, PSK, QPSK etc. are memory less modulation techniques.

Part B

1. Define a matched filter and compare its functioning with a correlator. (10)
2. Explain how a matched filter can maximize SNR for a given transmitted symbol. (6)
3. Derive the error probability expression for the MPSK. (16)
4. Explain the working of correlator type receiving filter (16)
5. Explain modified duo binary signaling scheme without and with precoder (16)
6. Discuss on signal design for ISI elimination (16)
7. Explain the working of maximum likelihood detector (16)

UNIT-V

ERROR CONTROL CODING

1. What is linear code? (Dec-07)

A code is linear if the sum of any two code vectors produces another code vector. A code is linear if modulo-2 sum of any two code vectors produces another code vector. This means any code vector can be expressed as linear combination of other code vectors.

2. What is code rate?

Code rate is the ratio of message bits (k) and the encoder output bits (n). It is defined by r (i.e) $r = k/N$

3. Define code efficiency.

It is the ratio of message bits in a block to the transmitted bits for that block by the encoder i.e

$$\text{Code efficiency} = \frac{\text{Message bits in a block}}{\text{Transmitted bits for the block}}$$

4. What is hamming distance? (Dec-09)

The hamming distance between two code vectors is equal to the number of elements in which they differ. For example, let the two code words be, $X = (101)$ and $Y = (110)$ these two code words differ in second and third bits. Therefore the hamming distance between X and Y is two.

5. What is meant by systematic and non-systematic codes?

In a Systematic block code, message bits appear first and then check bits. In the non-systematic code message and check bits cannot be identified in the code vector.

6. How syndrome is calculated in Hamming codes and cyclic codes? (Dec-04)

In Hamming codes the syndrome is calculated as ,

$$S = YH^T$$

Here Y is the received and H^T is the transpose of parity check matrix.

In cyclic code, the syndrome vector polynomial is given as,

$$S(P) = \text{remainder} (Y(P) / G(P))$$

$Y(P)$ is received vector polynomial and $G(p)$ is generator polynomial.

7. What are the conditions to satisfy the hamming code?

- 1) No. of Check bits $q \geq 3$
- 2) Block length $n = 2^q - 1$
- 3) No of message bits $K = n - q$
- 4) Minimum distance $d_{min} = 3$.

8. What are the error detection and correction capabilities of hamming codes? (May-09)

The minimum distance (d_{min}) of hamming codes is 3, Hence it can be used to detect double errors or correct single errors. Hamming codes are basically linear block codes with $d_{min} = 3$.

9. Define code word & block length.

The encoded block of 'n' bits is called code word. The no. of bits 'n' after coding is called block length.

10. What is difference between block codes and convolutional codes? (Dec-05)

Block codes takes k .number of bits simultaneously form n-bit .code vector. This code vector is also called block. Convolutional code takes one message bits at a time and generates two or more encoded bits. Thus convolutional codes generate a string of encoded bits for input message string.

11. What is convolutional code? (May-05)

Fixed number of input bits is stored in the shift register & they are combined with the help of mod 2 adders. This operation is equivalent to binary convolution coding.

12. What is meant by syndrome of linear block code? (May-04)

The non zero output of the produce YH^T is called syndrome & it is used to detect the errors in y. Syndrome is denoted by S & given as, $S = YH^T$

13. What are the advantages of convolutional codes?

Advantages:

1. The decoding delay is small in convolutional codes since they operate on smaller blocks of data. 2. The storage hardware required by convolutional decoder is less since the block sizes are smaller.

Disadvantages:

1. Convolutional codes are difficult to analyze since their analysis is complex.
2. Convolutional codes are not developed much as compared to block codes.

14. Define states of encoder?

The constraint length of the given convolutional encoder is $K=2$. Its rate is $\frac{1}{2}$ means for single message bit input, two bits x_1 and x_2 are encoded at the output. S_1 represents the input message bit and S stores the previous message bit. Since only one previous message bit is stored, this encoder can have states depending upon this stored message bit.

Let s represent,

$$\begin{aligned} S_2 = 0 & \text{ state „a“} \\ S_2 = 1 & \text{ state „b“} \end{aligned}$$

15. Define constraint length in convolutional codes?

Constraint length is the number of shifts over which the single message bit can influence the encoder output. This is expressed in terms of message bits.

16. Define minimum distance. (MAY-07)

It is the smallest hamming distance between the valid code vectors. The error detecting and correcting capabilities of the codes depend upon the minimum distance.

17. Define hamming weight. (MAY-09)

The number of 1's in the code word of the hamming code is called as hamming distance.

18. What are the classifications of line codes?

Line code is classified as

1. Polar
2. Unipolar.
3. Bipolar

19. What is Manchester code? (May-12)

In the Manchester code binary '1' is encoded by positive half pulse followed by negative pulse. And binary '0' is encoded by negative half pulse followed by positive pulse.

20. State any desirable properties of a line code. (Dec-12)

1. The PAM signal should have adequate timing content, so that clock information can be extracted from the waveform.
2. The PAM signal should be immune to channel noise and interference.
3. The PAM signal should allow error detection and correction.

21. What are the advantages of cyclic codes?

1. Encoders and decoders for cyclic codes are simple

2. Cyclic codes also detect error burst that span many successive bits.

22. What is meant by cyclic codes?

Cyclic codes are the subclasses of linear block codes. They have the property that a cyclic shift of one codeword produces another code word.

23. Define free distance and coding gain.

Free distance is the minimum distance between code vectors. It is also equal to minimum weight of the code vectors. Coding gain is used as a basis of comparison for different coding methods. To achieve the same bit error rate the coding gain is defined as,

$$A = \frac{(E_b/N_0)_{\text{encoded}}}{(E_b/N_0)_{\text{coded}}}$$

For Convolutional coding, the coding gain is given as,

$$A = r d_f / 2$$

Here „r“ is the code rate

And „df is the free distance.

24. What are the advantages and disadvantages of cyclic codes? Advantages:

- ¾ The error detection and decoding methods of cyclic codes are simpler and easy to implement.
- ¾ The encoders and decoders are simpler than non cyclic codes.
- ¾ Cyclic codes have well defined mathematical structure. Hence, it is an efficient and powerful code to detect burst errors.

Disadvantages:

- ¾ The error detection is simple but error correction is little complicated
- ¾ The decoders used are complex circuit.

25. What is Vitterbi decoding scheme?

It performs maximum likelihood decoding and it reduces the computational load by taking advantages in code trellis. Decoding is done with algorithm.

26. What are the limitations of Vitterbi decoding?

It can correct up to 2 errors. A triple error pattern is un correctable by the Vitterbi algorithm. Constraint length increases complexity also increases exponentially.

- ¾ i) The error probability decreases easily
- ¾ ii) Decoding procedure is independent of constraint length.

Part B

1. Distinguish coherent and non-coherent detection. (4)
2. Explain non-coherent detection methods of binary frequency shift keying scheme. (12)
3. Discuss the representation and characteristics of ASK, PSK, QAM, QPSK and FSK signals.
4. Derive the bit error probability due to coherent ASK, PSK and FSK systems. Compare the performance of these systems.

5. Discuss QPSK signaling. (3)
6. Derive the bit error probability due to QPSK receiver. Compare the performance of QPSK receiver with that of PSK receiver. (13)
7. Derive the expression for the BPSK technique. (16)
8. Explain the MFSK and derive the probability of error. (16)
9. Draw the space diagram of MSK and explain about the same. (16)

VSB ENGINEERING COLLEGE
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
EC6502 PRINCIPLES OF DIGITAL SIGNAL PROCESSING

(2 Marks Questions with Answers and 16 Marks)

UNIT I DISCRETE FOURIER TRANSFORM
PART-A

1. Define DSP.

DSP - Digital Signal Processing. It is defined as changing or analyzing information which is measured as discrete time sequences.

2. List out the basic elements of DSP.

- $\frac{3}{4}$ Signal in
- $\frac{3}{4}$ Analog to Digital converter
- $\frac{3}{4}$ Digital Signal processor
- $\frac{3}{4}$ Digital to Analog converter
- $\frac{3}{4}$ signal out

3. Mention the advantages of DSP.

- (i) Veracity
- (ii) Simplicity
- (iii) Repeatability

4. Give the applications of DSP.

- * Telecommunication – spread spectrum, data communication
- * Biomedical – ECG analysis, Scanners.
- * Speech/audio – speech recognition
- * Military – SONAR, RADAR

5. Define Signal.

Signal is a physical quantity that varies with respect to time, space or any other independent variable. (Or) It is a mathematical representation of the system

Eg. $y(t) = t$ and $x(t) = \sin t$.

6. Define system.

A set of components that are connected together to perform the particular task. E.g. Filters.

7. What are the major classifications of the signal?

- (i) Discrete time signal
- (ii) Continuous time signal

8. Define continuous time signals and classify them.

Continuous time signals are defined for a continuous of values of the Independent variable. In the case of continuous time signals the independent variable is continuous. For example:

- (i) A speech signal as a function of time
- (ii) Atmospheric pressure as a function of altitude

Classification of continuous time signal: (i) Periodic and A periodic signal (ii) Even and Odd signal

9. Define discrete time signals and classify them.

Discrete time signals are defined only at discrete times, and for these signals, the independent variable takes on only a discrete set of values.

Classifications of discrete time signals are,

1. Periodic and A periodic signal
2. Even and Odd signal

10. Define discrete time unit step & unit impulse.

Discrete time Unit impulse is

$$\delta[n] = \begin{cases} 1, & n=0; \\ 0, & \text{otherwise} \end{cases}$$

Unit impulse is also known as unit sample. Discrete time unit step signal is

$$U[n] = \begin{cases} 0, & n < 0 \\ 1, & n \geq 0 \end{cases}$$

11. Define even and odd signal. (NOV/DEC-2010)

A discrete time signal is said to be even when, $x[-n]=x[n]$. The continuous time signal is said to be even when, $x(-t)=x(t)$

For example, Cosine wave is an even signal. The discrete time signal is said to be odd when $x[-n]= -x[n]$

¾ The continuous time signal is said to be odd when $x(-t)= -x(t)$

¾ Odd signals are also known as non-symmetrical signal. Sine wave signal is an odd signal.

12. Define Energy and power signal.

A signal is said to be energy signal if it have finite energy and zero power. A signal is said to be power signal if it have infinite energy and finite power. If the above two conditions are not satisfied then the signal is said to be neither energy nor power signal.

13. What is analog signal?

The analog signal is a continuous function of independent variables. The analog Signal is defined for every instant of independent variable and so magnitude of Independent variable is continuous in the specified range. Here both the independent Variable and magnitude are continuous.

14. What is digital signal?

The digital signal is same as discrete signal except that the magnitude of signal is quantized.

15. What are the different types of signal representations?

- a). Graphical representation
- b). Functional representations
- c). Tabular representation
- d). Sequence representation.

16. Define periodic and non periodic discrete time signals?

If the discrete time signal repeated after equal samples of time then it is called periodic signal. When the discrete time signal $x[n]$ satisfies the condition $x[n+N]=x[n]$, then it is called periodic signal with fundamental period N samples. If $x[n] \neq x[n+N]$ then it is called non periodic signals.

17. State the classification of discrete time signals.

The types of discrete time signals are

- * Energy and power signals
- * Periodic and A periodic signals
- * Symmetric (Even) and Ant symmetric (Odd) signals

18. Define energy and power signal.

If E is finite i.e. $0 < E < \infty$, then $x(n)$ is called energy signal.

If P is finite i.e. $0 < P < \infty$, then the signal $x(n)$ is called a power signal.

19. What are all the blocks are used to represent the CT signals by its samples?

- (i) Sampler (ii) Quantizer

20. Define sampling process.

Sampling is a process of converting Ct signal into Dt signal.

21. Mention the types of sampling.

- (i) Up sampling (ii) Down sampling

22. What is meant by quantizer?

It is a process of converting discrete time continuous amplitude into discrete time discrete amplitude.

23. Define system function?

The ratio between z transform of out put signal $y(z)$ to z transform of input signal $x(z)$ is called system function of the particular system.

24. List out the types of quantization process.

- (i) Truncation (ii) Rounding

25. Define truncation.

Truncating the sequence by multiplying with window function to get the finite value.

26. State sampling theorem. (APRIL/MAY 2011) (NOV/DEC-11)

$\frac{3}{4}$ A band limited signal of finite energy, which has no frequency components higher than the W hertz, is completely described by specifying the values of the signal at the instant of time separated by $1/2W$ seconds and

$\frac{3}{4}$ A band limited signal of finite energy, which has no frequency components higher than the W hertz, is completely recovered from the knowledge of its samples taken at the rate of $2W$ samples per second.

¾ The sampling frequency must be at least twice the maximum frequency present in the signal.
That is $F_s =$

$> 2f_m$ Where, $F_s =$ sampling frequency

$f_m =$ maximum frequency

27. Define Nyquist rate. (MAY/JUNE-12)

It is the minimum rate at which a signal can be sampled and still reconstructed from its samples.
Nyquist rate is always equal to $2f_m$.

28. Define aliasing or folding. (APRIL/MAY 2011) (NOV/DEC-2010)

The superimposition of high frequency behaviour on to the low frequency behaviour is referred as aliasing. This effect is also referred as folding.

29. What is the condition for avoid the aliasing effect?

To avoid the aliasing effect the sampling frequency must be twice the maximum frequency present in the signal.

30. What is meant by interpolation?

It is also referred as up sampling. that is , increasing the sampling rate.

31. What is an anti-aliasing filter?

A filter that is used to reject high frequency signals before it is sampled to remove the aliasing of unwanted high frequency signals is called an ant aliasing filter.

32. Mention the types of sample/hold?

¾ Zero order hold

¾ First order hold

33. What is meant by sampling rate?

Sampling rate = number of samples / second.

34. What is meant by step response of the DT system?

The output of the system $y(n)$ is obtained for the unit step input $u(n)$ then it is said to be step response of the system.

35. Define Transfer function of the DT system.

The Transfer function of DT system is defined as the ratio of Z transform of the system output to the input. That is, $H(z) = Y(z)/X(z)$.

36. Define impulse response of a DT system.

The impulse response is the output produced by DT system when unit impulse is applied at the input. The impulse response is denoted by $h(n)$. The impulse response $h(n)$ is obtained by taking inverse Z transform from the transfer function $H(z)$.

37. What are the properties of convolution?

(I) Commutative (II) Associative (III) Distributive

38. State the Commutative properties of convolution. (NOV/DEC-11)

Commutative property of Convolution is,

$$x(n)*h(n) = h(n)*x(n)$$

39. State the Associative properties of convolution

Associative Property of convolution is, $[x(n)*h_1(n)]*h_2(n)=x(n)*[h_1(n) h_2(n)]$

40.State Distributive properties of convolution. (NOV/DEC-11)

The Distributive Property of convolution is,

$$\{x(n)*[h_1(n)+ h_2(n)]\} = [x(n)*h_1(n) + x(n)*h_2(n)]$$

41. Define causal LTI DT system.

For a LTI system to be causal if $h(n)=0$, for $n<0$.

42.What are the steps involved in calculating convolution sum?

The steps involved in calculating sum are

1).Folding 2). Shifting 3).Multiplication

4).Summation

43. What is the condition for stable LTI DT system?

A LTI system is stable if, there the summation is absolutely sumable.

44. Define a causal system.

The causal system generates the output depending upon present &past inputs only. A causal system is non anticipatory.

45. What is meant by linear system?

A linear system should satisfy superposition principle. A linear system should satisfy $F[ax_1(n)+bx_2(n)]$

$= a y_1(n)+by_2(n)$ Where, $y_1(n)=F[x_1(n)]$ $y_2(n)=F[x_2(n)]$

46. Define linear time invariant system. (NOV/DEC-11)

- 1 .A system is time invariant if the behaviour and characteristics of the system are fixed over time.
2. A system is time invariant if a time shift in the input signal results in an identical time shift in the output signal.
3. For example, a time invariant system should produce $y(t-t_0)$ as the output when $x(n-n_0)$ is the input.

PART-B

1).Explain the digital signal processing system with necessary sketches and gives its merits and demerits.

2).Starting from first principles, state and explain sampling theorem both in time domain and in frequency domain.

3).Check for following systems are linear, causal, time in variant, static.

(i) $y(n) = x(1/2n)$ (ii) $y(n) = \sin (x(n))$ (iii) $y(n) = x(n) \cos(x(n))$ (iv) $y(n) =x(-n+5)$

(v) $y(n) = x(n) + n x(n+2)$.

4).compute linear and circular convolution of the two sequence $x_1(n) = \{1, 2, 2, 2\}$ and

$$X_2(n) = \{1, 2, 3, 4\}.$$

5). Discuss whether the following are energy or power signals (i) $x(n) = (3/2)^n u(n)$ (ii) $x(n) = Ae^{j\omega n}$

6). Describe in detail the process of sampling and quantization. Also determine the expression for quantization.

7). Check whether the following are periodic. (i) $x(n) = \cos(3\pi n)$ (ii) $x(n) = \sin(3n)$

UNIT II IIR FILTER DESIGN

PART-A

1. Define z transform?

The Z transform of a discrete time signal $x(n)$ is defined as,

$$X(z) = \sum_{n=-\infty}^{\infty} x(n) z^{-n}$$

Where, z is a complex variable. In polar form $z=re-j\omega$

2. What is meant by ROC? (APRIL/MAY 2011-14) (NOV/DEC-11)

The region of convergence (ROC) is defined as the set of all values of z for which $X(z)$ converges.

3. Explain about the roc of causal and anti-causal infinite sequences?

For causal system the roc is exterior to the circle of radius r . For anti causal system it is interior to the Circle of radius r .

4. Explain about the roc of causal and anti causal finite sequences

For causal system the roc is entire z plane except $z=0$. For anti causal system it is entire z plane except $z=\alpha$.

5. What are the properties of ROC?

- The ROC is a ring or disk in the z plane centered at the origin.
- The ROC cannot contain any pole.
- The ROC must be a connected region
- The ROC of an LTI stable system contains the unit circle.

6. Explain the linearity property of the z transform

If $z\{x_1(n)\}=X_1(z)$ and $z\{x_2(n)\}=X_2(z)$ then, $z\{ax_1(n)+bx_2(n)\}=aX_1(z)+bX_2(z)$

a & b are constants.

7. State the time shifting property of the z transform

If $z\{x(n)\}=X(z)$ then $z\{x(n-k)\}=z^{-k}X(z)$

8. State the scaling property of the z transform

If $z\{x(n)\}=X(z)$ then $z\{ax(n)\}=X(az)$

13. State the time reversal property of the z transform.(MAY-12)

If $z\{x(n)\}=X(z)$ then $z\{x(-n)\}=X(z^{-1})$

14. Write the convolution property of the z transform

If $z\{x(n)\}=X(z)$ & $z\{h(n)\}=H(z)$ then, $z\{x(n)*h(n)\}=X(z)H(z)$

11. Write the multiplication property of z transform

If $z\{x(n)\}=x(z)$ & $z\{h(n)\}=h(z)$ then,

12.State Parseval's relation in z transform.(MAY/JUNE-2014)

If $x_1[n]$ and $x_2[n]$ are complex valued sequences, then the Parseval's relation states that $x_1[n] x_2^*[n] = \frac{1}{2\pi j} \int_{\gamma} X_1(v) X_2^*(1/v^*) v^{-1} dv$.

13.State initial value theorem of z transforms.(MAY/JUNE-14)

If $L[x(t)]=X(s)$, then initial value theorem states that $x(0)=\lim_{s \rightarrow \infty} sX(s)$

14.State final value theorem of z transforms. .(MAY/JUNE-14)

If $L[x(t)]=X(s)$, then final value theorem states that $\lim_{t \rightarrow \infty} x(t)=\lim_{s \rightarrow 0} sX(s)$
If $x(n)$ is causal $z\{x(n)\}=X(z)$,

15. Define system function.

The ratio between z transform of out put signal $y(z)$ to z transform of input signal $x(z)$ is called system function of the particular system.

16. What are the conditions of stability of a causal system?

All the poles of the system are within the unit circle. The sum of impulse response for all values of n is bounded.

17.What are the different methods of evaluating inverse z-transform?

It can be evaluated using several methods.

- i). Long division method
- ii). Partial fraction expansion method
- iii). Residue method
- iv). Convolution method

18.Give the Z-transform pair.

$$x(n) \xleftrightarrow{z} X(z)$$

19.What is the need for Z-transform?

Z-transform is used for analysis the both periodic and a periodic signals.

20.Give the Z-transform of unit sample

sequence $\delta(n)$. $Z[\delta(n)] = 1$

21.Define zeros.

The zeros of the system $H(z)$ are the values of z for which $H(z) = 0$.

22. Define poles.

The poles of the system $H(z)$ are the values of z for which $H(z) = \infty$.

23.What is the z-transform of A $\delta(n-m)$?

$$Z[A\delta(n-m)] = z^{-m}$$

24.Find Z transform of $x(n)=\{1,2,3,4\}$?

$$\begin{aligned}
 x(n) &= \{1, 2, 3, 4\} \quad X(z) = \sum_{n=0}^3 x(n)z^{-n} \\
 &= 1 + 2z^{-1} + 3z^{-2} + 4z^{-3} \\
 &= 1 + \frac{2}{z} + \frac{3}{z^2} + \frac{4}{z^3}
 \end{aligned}$$

25. State the convolution properties of Z transform?

The convolution property states that the convolution of two sequences in time domain is equivalent to multiplication of their Z transforms.

26. What z transform of (n-m)?

By time shifting property

$$Z[A(n-m)] = AZ^{-m} \sin Z[n] = 1$$

27. Obtain the inverse z transform of $X(z) = \frac{1}{z-a}, |z| > |a|$?

Given $X(z) = \frac{1}{z-a}$ By time shifting property $X(n) = a^n u(n-1)$

28. What is the relation between DFT and Z transform? (APRIL/MAY 2011)

Both DFT and Z-transform work for discrete signal. I have read that "Z-transform is the general

case of DFT, when we consider unit circle then, Z-transform becomes Discrete Fourier Transform (DFT)".

PART-B

- 1). Explain in detail about overlap add method and overlap save method for filtering of long data sequences using DFT.
- 2). Develop a 8 point DIT-FFT algorithm. Draw the signal flow graph.
- 3). Explain Radix-2 DIT-FFT algorithm. Compare it with DIT-FFT algorithms.
- 4). Compute the linear convolution of finite duration sequences $h(n) = \{1, 2\}$ and $x(n) = \{1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1\}$ by overlap add method.
- 5). Compute the eight-point DFT of the sequence $x(n) = 1 \quad 0 \leq n \leq 7$
 $\quad \quad \quad = 0 \quad \text{otherwise}$
- 6). By using DIT and DIF algorithm.
- 7). Summarize the Difference between overlap-save method and overlaps add method.
- 8). Compute an 8 point DFT of the sequence $x(n) = (1, 0, 1, -1, 1, -1, 0, 1)$.
- 9). Find the output $y(n)$ of a filter whose impulse response is $h(n) = \{1, 1, 1\}$ and input signal $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ overlap save method.

UNIT III FIR FILTER DESIGN

PART-A

1. Define DFT of a discrete time sequence.

The DFT is used to convert a finite discrete time sequence $x(n)$ to an N point frequency domain sequence $X(k)$. The N point DFT of a finite sequence $x(n)$ of length L , ($L < N$) is defined as

$$X(k) = \sum_{n=0}^{N-1} x(n) e^{-j2\pi kn/N}, \quad k = 0, 1, 2, \dots, N-1$$

2. Define Inverse DFT.

The Inverse DFT of the sequence of length N is defined as,

$$x(n) = \frac{1}{N} \sum_{k=0}^{N-1} X(k) e^{j2\pi kn/N}, \quad n = 0, 1, 2, \dots, N-1$$

3. List any four properties of DFT

- | | |
|-------------------|--------------------------|
| A). Periodicity | B). Linearity |
| C). Time reversal | D). Circular time shift |
| E). Duality | F). Circular convolution |
| G). Symmetry | H). Circular symmetry |

4. State periodicity property with respect to DFT.

If $x(k)$ is N -point DFT of a finite duration sequence $x(n)$, then $x(n+N) = x(n)$ for all n .

$$X(k+N) = X(k) \text{ for all } k.$$

5. State periodicity property with respect to DFT.

If $X_1(k)$ and $X_2(k)$ are N -point DFTs of finite duration sequences $x_1(n)$ and $x_2(n)$, then DFT $[a X_1(n) + b X_2(n)] = a X_1(k) + b X_2(k)$, a, b are constants.

6. State time reversal property with respect to DFT.

If DFT $[x(n)] = X(k)$, then

$$\text{DFT}[x((-n))N] = \text{DFT}[x(N-n)] = X((-k)N) = X(N-k)$$

7. Define circular convolution.

Let $x_1(n)$ and $x_2(n)$ are finite duration sequences both of length n with DFTs $x_1(k)$ and $x_2(k)$. If $X_3(k) = X_1(k) X_2(k)$, then the sequence $X_3(k)$ can be obtained by circular convolution.

8. What is the need for DFT?

DFT is used for analysis the both periodic and a periodic signals.

9. What is zero padding? What are its uses? (MAY/JUNE-2014)

Let the sequence $x(n)$ has a length L . If we want to find the N -point DFT ($N > L$) of the sequence $x(n)$, we have to add $(N-L)$ zeros to the sequence $x(n)$. This is known as Zero padding.

The uses of zero padding are

- 1) We can get better display of the frequency spectrum.
- 2) With zero padding the DFT can be used in linear filtering.

10. Why FFT is needed?

The direct evaluation of DFT requires complex multiplication and large values of N direct evaluation of the DFT is difficult. By using FFT computations can be reduced N complex additions. Thus for algorithm the number of complex.

11. What is FFT?

The Fast Fourier Transform is an algorithm used to compute the DFT. It makes use of the symmetry and periodicity properties of twiddle factor to effectively reduce the DFT computation time. It is based on the fundamental principle of decomposing the mutation of DFT of a sequence of length N into successively smaller DFTs.

12. How many multiplications and additions are required to compute N point DFT Using Radix-2 FFT?

The number of multiplications and additions required to compute N point DFT Using radix-2 FFT are $N \log_2 N$ and $N/2 \log_2 N$ respectively.

13. What is meant by radix-2 FFT?

The FFT algorithm is most efficient in calculating N point DFT. If the number of output points N can be expressed as a power of 2 that is $N=2^M$, where M is an integer, then this algorithm is known as radix-2 algorithm.

14. What is DIT algorithm?

Decimation-In-Time algorithm is used to calculate the DFT of a N point sequence. The idea is to break the N point sequence into two sequences, the DFTs of which can be combined to give the DFT of the original N point sequence. This algorithm is called DIT because the sequence $x(n)$ is often spitted into smaller sub- sequences.

15. What DIF algorithm?

It is a popular form of the FFT algorithm. In this the output sequence $X(k)$ is divided into smaller and smaller sub-sequences, So it is called the name is "Decimation In Frequency".

16. What are the applications of FFT algorithm?

The applications of FFT algorithm includes

- 1) Linear filtering
- 2) Correlation
- 3) Spectrum analysis

17. Distinguish between linear convolution and circular convolution of two sequences.

If $x(n)$ is a sequence of L number of samples and $h(n)$ with M number of samples, after convolution $y(n)$. If Circular convolution $x(n)$ is a sequence of L number of samples.

18. What are the differences and similarities between DIF and DIT

algorithms? Differences:

1) The input is bit reversed while the output is in natural order for DIT, whereas for DIF the output is bit reversed while the input is in natural order.

2) The DIF butterfly is slightly different from the DIT butterfly, the difference being that the complex multiplication takes place after the add-subtract operation in DIF. Similarities:

Both algorithms require same number of operations to compute the DFT. Both algorithms can be done in place and both need to perform bit reversal at some place during the computation.

19. What is meant by radix-2 FFT?

If the number of output points N can be expressed as a power of 2, i.e., $N = 2^M$ Where M is an integer then this algorithm is known as radix-2 algorithm.

20. What is DIT radix-2 algorithm?

The radix 2 DIT FFT is an efficient algorithm for computing DFT. The idea is to break N point sequence in to two sequences, the DFT of which can be combined to give DFT of the original N -point sequence. Initially the N point sequence is divided in to two $N/2$ point sequences, on the basis of odd and even and the DFTs of them are evaluated and combined to give N -point sequence. Similarly the $N/2$ DFT s are divided and expressed in to the combination of $N/4$ point DFTs. This process is continued until we left with 2-point DFT"s.

21. What is DIF radix-2 algorithm?

1. The radix 2 DIF FFT is an efficient algorithm for computing DFT in this the out put sequence $x(k)$ is divided in to smaller and smaller.

2. The idea is to break N point sequence in to two sequences $x_1(n)$ and $x_2(n)$ consisting of the first $N/2$ points of $x(n)$ and last $N/2$ points of $x(n)$ respectively. Then we find $N/2$ point sequences $f(n)$ and $g(n)$ Similarly).

3. The $N/2$ DFT s are divided and expressed in to the combination of $N/4$ point DFT" s. This process is continued until we left with 2-point DFT"s.

22. What are the differences between DIT and DIF algorithms? (MAY/JUNE-14)(NOV/DEC-10)

* For DIT the input is bit reversed and the output is in natural order, and in DIF the input is in natural order and output is bit reversed.

* In butterfly the phase factor is multiplied before the add and subtract operation but in DIF it is multiplied after add-subtract operation.

1).DIT – Time is decimated and input is bit reversed format output in natural order

2).DIF – Frequency is decimated and input is natural order output is bit reversed Format

23. What is meant by in place in DIT and DFT algorithm?

An algorithm that uses the same location to store both the input and output sequence is called in-place algorithm.

25. How many stages are there for 8 point DFT

3 stages

26 How many multiplication terms are required for doing DFT by expressional?

Expression Method and FFT method

Expression $-N^2$ FFT - $N/2 \log N$

27. What is DFT?

It is a finite duration discrete frequency sequence which is obtained by sampling one period of Fourier transform. Sampling is done at „N „equally spaced points over the period extending from $\omega = 0$ to $\omega = 2\pi$.

28. What is the DFT of unit impulse $\delta(n)$?

The DFT of unit impulse $\delta(n)$ is unity.

29. Why the result of circular and linear convolution is not same?

Circular convolution contains same number of samples as that of $x(n)$ and $h(n)$, while in linear convolution, number of samples in the result(N) are, $N = L + M - 1$.

Where, L = Number of samples in $x(n)$.

M = Number of samples in $h(n)$. So the result of linear and circular convolution is not same.

30. How to obtain same result from linear and circular convolution?

* Calculate the value of „N“, that means number of samples contained in linear convolution.

* By doing zero padding make the length of every sequence equal to number of samples contained in linear convolution.

* Perform the circular convolution. The result of linear and circular convolution will be same.

31. How will you perform linear convolution from circular convolution?

* Calculate the value of „N“, that means number of samples contained in linear convolution.

* By doing zero padding make the length of every sequence equal to number of samples contained in linear convolution.

* Perform the circular convolution. The result of linear and circular convolution will be same.

32. What methods are used to do linear filtering of long data sequences?

* Overlap save method. * Overlap adds method.

33. What is the disadvantage of direct computation of DFT?

For the computation of N-point DFT, N^2 complex multiplication and $N^2 - N$ complex additions are required. If the value of N is large then the number of computations will go into lakhs. This proves inefficiency of direct DFT computation.

34. What is the way to reduce number of arithmetic operations during DFT computation?

Numbers of arithmetic operations involved in the computation of DFT are greatly reduced by using different FFT algorithms as follows,

1). Radix-2 FFT algorithm.

A). Radix-2 Decimation In Time (DIT) algorithm.

B). Radix-2 Decimation In Frequency (DIF) algorithm.

2). Radix-4 FFT algorithm.

35. What are the properties of twiddle factor?

* Twiddle factor is periodic.

* Twiddle factor is symmetric.

36. What is up sampling process and what its effect?

Addition of one zero after each sample in $x(n)$ is called up sampling process. Due to this process, the entire DFT repeats one time.

37. How linear filtering is done using FFT?

Correlation is the basic process of doing linear filtering using FFT. The correlation is nothing but the convolution with one of the sequence, folded. Thus, by folding the sequence $h(n)$, we can compute the linear filtering (convolution) using FFT.

PART-B

1). Explain the designing of FIR filters using frequency sampling method.

2). State and explain the properties of FIR filters. State their importance. (8)

3). Explain linear phase FIR structures. What are the advantages of such structures?

4). Design an ideal high pass filter with a frequency response

$$H_d(e^{j\omega}) = 1 \text{ for } \pi/4 \leq |\omega| \leq \pi$$

$= 0$ for $|\omega| \leq \pi/4$ Find the values of $h(n)$ for $N = 11$ using hamming window. Find $H(z)$ and determine the magnitude response.

5). Explain the designing of FIR filters using Windows.

6). Obtain the direct form I, direct form II and Cascade form realization of the following system functions. $y(n] = 0.1 y(n-1) + 0.2 y(n-2) + 3x(n) + 3.6 x(n-1) + 0.6 x(n-2)$.

UNIT IV FINITE WORD LENGTH EFFECTS
PART-A

1. What is a digital filter?

A digital filter is a device that eliminates noise and extracts the signal of interest from other signals.

2. Analog filters are composed of which parameters?

1). pass band 2).stop band 3).Cut-off frequency

3. Define pass band.

It passes certain range of frequencies. In this, attenuation is zero.

4. Define stop band.

It suppresses certain range of frequencies. In this, attenuation is infinity.

5. What is mean by cut-off frequency?

This is the frequency which separates pass band and stop band.

6. What is the difference between analog and digital filters?

Analog filters are designed using analog components (R,L,C) while digital filters are implemented using difference equation and implemented using software.

7. What are the basic types of analog filters?

1). Low pass filter – LPF 2).High pass filter – HPF 3).Band pass filter - BPF
4).Band stop filter - BSF

8. What is the condition for digital filter to be realized?

The impulse response of filter should be causal, $h(n) = 0$ for $n < 0$.

9. Why ideal frequency selective filters are not realizable?

Ideal frequency selective filters are not realizable because they are non-causal. That is, its impulse response is present for negative values of „n“ also.

10. For IIR filter realization what is required?

Present, past, future samples of input and past values of output are required.

11. Why IIR systems are called recursive systems?

Because the feedback connection is present from output side to input

12. Which types of structures are used to realize IIR systems?

1). Direct form structure 2).Cascade form structure 3).Parallel form structure

13. Why direct form-II structure is preferred most and why?

The numbers of delay elements are reduced in direct form-II structure compared to direct form-I structure. That means the memory locations are reduced in direct form-II structure.

14. Why direct form-I and direct form-II are called as direct form structures?

The direct form-I and direct form-II structures are obtained directly from the corresponding transfer function without any rearrangements. So these structures are called as direct form structures.

15. What is advantage of direct form structure?

Implementation of direct form is very easy.

16. Give the disadvantage of direct form structure?

Both direct form structures are sensitive to the effects of quantization errors in the coefficients. So practically not preferred

17. What is the use of transpose operation?

If two digital structures have the same transfer function then they are called as equivalent structures. By using the transpose operation, we can obtain equivalent structure from a given realization structure.

18. What is transposition or flow graph reversal theorem?

If we reverse the directions of all branch transmittances and interchange input and output in the flow graph then the system transfer function remains unchanged.

19. How a transposed structure is obtained?

- 1). Reverse all signal flow graph directions.
- 2). Change branching nodes into adders and vice-versa.
- 3). Interchange input and output.

20. Why feed back is required in IIR systems?

It is required to generate infinitely long impulse response in IIR systems.

21. Write the expression for order of Butterworth filter?

The expression is $N = \log(\lambda/\epsilon)^{1/2} / \log(1/k)^{1/2}$

22. Write the expression for the order of chebyshev filter?

$$N = \cosh^{-1}(\lambda/\epsilon) / \cosh^{-1}(1/k)$$

23. Write the various frequency transformations in analog domain?

LPF to LPF: $s = s/\Omega_c$

LPF to HPF: $s = \Omega_c/s$

LPF to BPF: $s = s^2 \times |x_u| / (s(x_u - x_l))$

LPF to BSF: $s = s(x_u - x_l) \times s^2 \times |x_u|$. $X = \Omega$

24. Write the steps in designing chebyshev filter?

1. Find the order of the filter.
2. Find the value of major and minor axis.
3. Calculate the poles.

4. Find the denominator function using the above poles.
5. The numerator polynomial value depends on the value of n.

If n is odd: put s=0 in the denominator polynomial. If n is even put s=0 and divide it by $(1+e^2)^{1/2}$

25. Write down the steps for designing a Butterworth filter?

1. From the given specifications find the order of the filter
2. find the transfer function from the value of N
3. Find Ω_c
4. find the transfer function $h_a(s)$ for the above value of Ω_c by substituting s by that value.

26. State the equation for finding the poles in chebyshev filter.

$$s_k = a \cos \phi_k + j b \sin \phi_k, \text{ where } \phi_k = \left[\frac{\pi}{2} + (2k-1)/2n \right] \pi$$

27. State the steps to design digital IIR filter using bilinear method.

Substitute s by $2/T (z-1/z+1)$, where $T=2/\Omega (\tan (w/2))$ in $h(s)$ to get $h(z)$

28. What is warping effect or frequency warping? (NOV/DEC-10)

For smaller values of w there exist linear relationship between w and but for Larger values of w the relationship is nonlinear. This introduces distortion in the Frequency axis. This effect compresses the magnitude and phase response. This Effect is called warping effect.

29. Write a note on pre warping or pre scaling. (APRIL/MAY 2011) (MAY/JUNE-2014)

The effect of the non linear compression at high frequencies can be compensated. When the desired magnitude response is piecewise constant over frequency, this Compression can be compensated by introducing a suitable rescaling or pre warping the critical frequencies.

30. Give the bilinear transform equation between s plane and z plane.

$$s = 2/T (z-1/z+1)$$

31. Give hamming window function. (MAY/JUNE-14)

The equation for Hamming window is given by

$$W_H(n) = \begin{cases} 0.54 - 0.46 \cos 2\pi n/M-1 & 0 \leq n \leq M-1 \\ 0 & \text{otherwise} \end{cases}$$

32. What is meant by impulse invariant method?

In this method of digitizing an analog filter, the impulse response of the resulting digital filter is a sampled version of the impulse response of the analog filter. For e.g. if the transfer function is of the form, $1/s-p$, then

$$H(z) = 1/1-e^{-pT}z^{-1}$$

33. What do you understand by backward difference?

One of the simplest methods of converting analog to digital filter is to approximate the differential equation by an equivalent difference equation.

$$d/dt(y(t)/t=nT=(y(nT)-y(nT-T))/T$$

34. What are the significance of chebyshev filter? (NOV/DEC-10)

1. The magnitude response of the chebyshev filter exhibits ripple either in the stop band or the pass band.
2. The poles of this filter lies on the ellipse.

35. Give the Butterworth filter transfer function and its magnitude characteristics for Different orders of filter.

The transfer function of the Butterworth filter is given by

$$H(j\Omega) = 1/1+j(\Omega/\Omega_c)^N$$

36. Give the equation for the order N, major, minor axis of an ellipse in case of chebyshev filter?

The order is given by $N = \cosh^{-1}(((10^{-1\alpha_p}) - 1/10^{-1\alpha_s} - 1)/2) / \cosh^{-1}(\Omega_s/\Omega_p)$

$$A = (\mu^{1/N} - \mu^{-1/N})/2\Omega_p$$

$$B = \Omega_p (\mu^{1/N} + \mu^{-1/N})/2$$

37. How can you design a digital filter from analog filter?

Digital filter can be designed from analog filter using the following methods

1. Approximation of derivatives
2. Impulse invariant method (IIM)
3. Bilinear transformation (BLT)

38. Write down bilinear transformation. $s=2/T(z-1/z+1)$

39. What is a disadvantage of BLT method?

The mapping is non-linear and because of this, frequency warping effect takes place.

40. List the Butterworth polynomial for various orders.

N Denominator polynomial

- 1). $S+1$
- 2). $S^2+.707s+1$
- 3). $(s+1)(s^2+s+1)$
- 4). $(s^2+.7653s+1)(s^2+1.84s+1)$
- 5). $(s+1)(s^2+.6183s+1)(s^2+1.618s+1)$
- 6). $(s^2+1.93s+1)(s^2+.707s+1)(s^2+.5s+1)$
- 7). $(s+1)(s^2+1.809s+1)(s^2+1.24s+1)(s^2+.48s+1)$

41. Differentiate Butterworth and Chebyshev filter.

Butterworth damping factor 1.44 and chebyshev is 1.06. Butterworth is flat response .but chebyshev is damped response.

42. What is filter?

Filter is frequency selective devices, which amplify particular range of frequencies and attenuate particular range of frequencies.

43. What are the types of digital filter according to their impulse response?

IIR (Infinite impulse response) filter FIR (Finite Impulse Response) filter.

44. How phase distortion and delay distortion are introduced?

1. The phase distortion is introduced when the phase characteristics of a filter is Nonlinear with in the desired frequency band
2. The delay distortion is introduced when the delay is not constant with in the desired frequency band

45. Define IIR filter.

The filters designed by considering all the infinite samples of impulse response are called IIR filter.

46. What is the limitation of approximation of derivative method?

It is suitable only for designing of low pass and band pass IIR digital filters with relatively small resonant frequencies.

47. What is the condition for linear phase FIR filter? (APRIL/MAY 2011)

Linear phase is a property of a filter, where the phase response of the filter is a linear function of frequency. The result is that all frequency components of the input signal are shifted in time (usually delayed) by the same constant amount, which is referred to as the phase delay. And consequently, there is no phase distortion due to the time delay of frequencies relative to one another.

A filter with linear phase may be achieved by an FIR filter which is either symmetric or anti-

A necessary but not sufficient condition is:

$$\sum_{n=-\infty}^{\infty} h[n] \cdot \sin(\omega \cdot (n - \alpha) + \beta) = 0$$

For some α, β .^[2]

48. What is Gibb's Phenomenon?(MAY/JUNE-12)

One possible way of finding an FIR filter that approximates $H(e^{j\omega})$ would be to truncate the infinite Fourier series at $n=\pm(N-1/2)$. Direct truncation of the series will lead to fixed

percentage overshoots and undershoots before and after an approximated discontinuity in the frequency response.

PART-B

- 1). Explain the characteristics of limit cycle oscillation with respect to the system described by the difference equation: $y(n) = 0.95 y(n-1) + x(n)$; $x(n) = 0$ and $y(-1) = 13$. Determine the Dead band range of the system.
- 2). Explain the limit cycle oscillations due to product round off and overflow errors.
- 3). Discuss in detail the errors resulting from rounding and truncation.
- 4). Explain the quantization process and errors introduced due to quantization.
- 5). Describe the quantization in floating point realization of IIR digital filters.
- 6). Discuss about signal scaling and coefficient quantization.

UNIT V DSP APPLICATIONS **PART-A**

1. State some applications of DSP?

- Speech processing
- Image processing
- Radar signal processing.

2. Define sampling rate conversion.

Sampling rate conversion is the process of converting the sequence $x(n)$ which is got from sampling the continuous time signal $x(t)$ with a period T , to another sequence $y(k)$ obtained from sampling $x(t)$ with another period T' .

3. State the methods to convert the sampling rate.

There are two methods:

- Resampling after reconstruction
- Conversion in digital domain

4. What is multirate signal processing?

Multirate signal processing is the technique of processing the signal with multiple sampling rates.

Advantages:

- Computational complexity is less
- Finite arithmetic effects are less
- Filter order required are low
- Sensitivity to filter coefficient lengths is less

5. State the applications of multirate signal processing.

- Sub-band coding
- Voice privacy using analog phone lines

- Signal compression by subsampling
- A/D and D/A convertors

The above applications come under the areas given below:

- Communication Systems
- Speech and audio processing systems
- Antenna systems
- Radar Systems

6. What is decimation?

Decimation is the process of reducing the sampling rate of the signal. It is otherwise called down- sampling or sampling rate compression.

7. What is interpolation?

Interpolation is the process of increasing the sampling rate of the signal. It is otherwise called down-sampling or sampling rate expansion.

8. Give short note on sub-band coding?

Signals which occupy contiguous frequency bands analysis filter bank. These signals are down-sampled, yielding sub- band signals, which are then compressed using encoders. The compressed signals are multiplexed and transmitted. On the receiving side, reverse operations are carried out. This process yields better compression ratio, because each sub-band signal can be represented using a different number of bits.

9. Give brief not on Speech Processing.

Speech processing includes processing like encoding, synthesis and recognition.

Encoding is performed to remove the redundant signal in a speech signal.

Compression/coding is performed in transmitter side and thus **synthesis** is required in receiver side.

Recognition is used to recognize both the speech and the speaker.

15. What are the different techniques of voice compression and coding?

- Waveform coding
- Transform Coding
- Frequency band encoding
- Parametric methods

16. Give short notes on image enhancement.

Image enhancement focuses mainly on the features of an image. The various feature enhancements are sharpening the image, edge enhancement, filtering, contrast enhancement, etc.

12. Give short notes on adaptive filters.

Adaptive filters are linear filters used in various areas where the statistical knowledge of the signals to be filtered/analyzed are not known a priori or the signals may be slowly time variant. Both IIR and FIR filters can be used in adaptive filtering, but FIR filters are mostly used due to its simplicity and adjustable zeros.

17. State the applications of adaptive filtering.

- Adaptive noise cancelling
- Line Enhancing
- Frequency Tracking
- Channel Equalization
- Echo cancellation

PART-B

- 1). Explain in detail about the polyphase implementation of FIR filters for interpolator and decimators.
- 2). Describe the procedure to implement digital filter bank using multirate signal processing.
- 3). Explain the application of multirate signal processing.
- 4). Explain how DSP can be used for speech processing.
- 5). Explain the efficient transversal structure for decimator and interpolator.
- 6). Explain the application of sampling rate conversion in sub-band coding and Narrow Band filter.

EC6503 TRANSMISSION LINES AND WAVEGUIDES
2 MARKS and 16 MARK QUESTION

UNIT I

TRANSMISSION LINE THEORY

2 MARKS:

1. Define the line parameters?

The parameters of a transmission line are:

- Resistance (R)
- Inductance (L)
- Capacitance (C)
- Conductance (G)
- Resistance (R) is defined as the loop resistance per unit length of the wire. Its unit is ohm/Km
- Inductance (L) is defined as the loop inductance per unit length of the wire. Its unit is Henry/Km
- Capacitance (C) is defined as the loop capacitance per unit length of the wire. Its unit is Farad/Km
- Conductance (G) is defined as the loop conductance per unit length of the wire. Its unit is mho/Km

2. What are the secondary constants of a line? Why the line parameters are called distributed elements?

The secondary constants of a line are: Characteristic Impedance Propagation Constant. Since the line constants R, L, C, G are distributed through the entire length of the line, they are called as distributed elements. They are also called as primary constants.

3. Define Characteristic impedance

Characteristic impedance is the impedance measured at the sending end of the line. It is given by $Z_0 = \sqrt{Z/Y}$, where

$Z = R + j\omega L$ is the series impedance

$Y = G + j\omega C$ is the shunt admittance

4. Define Propagation constant

Propagation constant is defined as the natural logarithm of the ratio of the sending end current or voltage to the receiving end current or voltage of the line. It gives the manner in the wave is propagated along a line and specifies the variation of voltage and current in the line as a function of distance. Propagation constant is a complex quantity and is expressed as $\gamma = \alpha + j\beta$. The real part is called the attenuation constant whereas the imaginary part of propagation constant is called the phase constant.

5. What is a finite line? Write down the significance of this line?

A finite line is a line having a finite length on the line. It is a line, which is terminated, in its characteristic impedance ($Z_R=Z_0$), so the input impedance of the finite line is equal to the characteristic impedance ($Z_s=Z_0$).

6. What is an infinite line?

An infinite line is a line in which the length of the transmission line is infinite. A finite line, which is terminated in its characteristic impedance, is termed as infinite line. So for an infinite line, the input impedance is equivalent to the characteristic impedance.

7. What is wavelength of a line?

The distance the wave travels along the line while the phase angle is changing through 2π radians is called a wavelength.

8. What are the types of line distortions?

The distortions occurring in the transmission line are called waveform distortion or line distortion.

Waveform distortion is of two types:

- a) Frequency distortion
- b) Phase or Delay Distortion.

9. How frequency distortion occurs in a line?

When a signal having many frequency components are transmitted along the line, all the frequencies will not have equal attenuation and hence the received end waveform will not be identical with the input waveform at the sending end because each frequency is having different attenuation. This type of distortion is called frequency distortion.

10. How to avoid the frequency distortion that occurs in the line?

In order to reduce frequency distortion occurring in the line, a) The attenuation constant α should be made independent of frequency. b) By using equalizers at the line terminals which minimize the frequency distortion. Equalizers are networks whose frequency and phase characteristics are adjusted to be inverse to those of the lines, which result in a uniform frequency response over the desired frequency band, and hence the attenuation is equal for all the frequencies.

11. What is delay distortion?

When a signal having many frequency components are transmitted along the line, all the frequencies will not have same time of transmission, some frequencies being delayed more than others. So the received end waveform will not be identical with the input waveform at the sending end because some frequency components will be delayed more than those of other frequencies. This type of distortion is called phase or delay distortion.

12. How to avoid the frequency distortion that occurs in the line?

In order to reduce frequency distortion occurring in the line,

- a) The phase constant β should be made dependent of frequency.
- b) The velocity of propagation is independent of frequency.
- c) By using equalizers at the line terminals which minimize the frequency distortion.

Equalizers are networks whose frequency and phase characteristics are adjusted to be inverse to those of the lines, which result in a uniform frequency response over the desired frequency band, and hence the phase is equal for all the frequencies.

13. What is a distortion less line? What is the condition for a distortion less line?

A line, which has neither frequency distortion nor phase distortion is called a distortion less line. The condition for a distortion less line is $RC=LG$. Also,

- a) The attenuation constant should be made independent of frequency.
- b) The phase constant should be made dependent of frequency.
- d) The velocity of propagation is independent of frequency.

14. What is the drawback of using ordinary telephone cables?

In ordinary telephone cables, the wires are insulated with paper and twisted in pairs, therefore there will not be flux linkage between the wires, which results in negligible inductance, and conductance. If this is the case, there occurs frequency and phase distortion in the line.

15. How the telephone line can be made a distortion less line?

For the telephone cable to be distortion less line, the inductance value should be increased by placing lumped inductors along the line.

16. What is Loading?

Loading is the process of increasing the inductance value by placing lumped inductors at specific intervals along the line, which avoids the distortion

17. What are the types of loading?

- a) Continuous loading
- b) Patch loading
- c) Lumped loading

18. What is continuous loading?

Continuous loading is the process of increasing the inductance value by placing a iron core or a magnetic tape over the conductor of the line.

19. What is patch loading?

It is the process of using sections of continuously loaded cables separated by sections of unloaded cables which increases the inductance value

20. What is lumped loading?

Lumped loading is the process of increasing the inductance value by placing lumped inductors at specific intervals along the line, which avoids the distortion

21. Define reflection coefficient

Reflection Coefficient can be defined as the ratio of the reflected voltage to the incident voltage at the receiving end of the line Reflection Coefficient $K = \frac{\text{Reflected Voltage at load}}{\text{Incident voltage at the load}}$.

22. Define reflection loss

Reflection loss is defined as the number of nepers or decibels by which the current in the load under image matched conditions would exceed the current actually flowing in the load.

23. What is Impedance matching?

If the load impedance is not equal to the source impedance, then all the power that are transmitted from the source will not reach the load end and hence some power is wasted. This is called impedance mismatch condition. So for proper maximum power transfer, the impedances in the sending and receiving end are matched. This is called impedance matching.

24. Define the term insertion loss

The insertion loss of a line or network is defined as the number of nepers or decibels by which the current in the load is changed by the insertion . Insertion loss= $\frac{\text{Current flowing in the load without insertion of the network}}{\text{Current flowing in the load with insertion of the network}}$

25. When reflection occurs in a line?

Reflection occurs because of the following cases:

- 1) when the load end is open circuited
- 2) when the load end is short-circuited
- 3) when the line is not terminated in its characteristic impedance

When the line is either open or short circuited, then there is not resistance at the receiving end to absorb all the power transmitted from the source end. Hence all the power incident on the load gets completely reflected back to the source causing reflections in the line. When the line is terminated in its characteristic impedance, the load will absorb some power and some will be reflected back thus producing reflections.

26. What are the conditions for a perfect line? What is a smooth line?

For a perfect line, the resistance and the leakage conductance value were neglected. The conditions for a perfect line are $R=G=0$. A smooth line is one in which the load is terminated by its characteristic impedance and no reflections occur in such a line. It is also called as flat line.

16 MARKS:

1. Discuss in detail about inductance loading of telephone cables and derive the attenuation constant, phase constant and velocity of signal transmission for the uniformly loaded cable.
2. Explain in detail about the reflection on a line not terminated in its characteristics impedance.
3. A transmission line operating at 500 MHz has $Z_0=80\Omega$, $\alpha= 0.04$ Np/m, $\beta=1.5$ rad/m. Find the line parameter series resistance (R Ω /m), series inductance (L H/m), shunt conductance (G mho/m) and capacitance between conductors (C F/m).
4. A distortion less transmission line has attenuation constant $\alpha=1.15\times 10^{-3}$ Np/m, and capacitance of 0.01 n F/m. the characteristic resistance $L/C=50\Omega$ find the resistance inductance and conductance per more of the line.
5. Derive the general transmission line equation for the voltage and current at any point on a line.
6. write a brief note on frequency and phase distortion.
7. The characteristics impedance of a 805m-long transmission line is $94 -23.2^0\Omega$ the attenuation constant is 74.5×10^{-6} Np/m. and the phase shift constant is 174×10^{-6} rad/m at 5KHz calculate the line parameters R,L,G and C per meter and the phase velocity on the line.
8. Derive expression for the attenuation and phase constant of transmission line in constant R,L,G and C. The constants of a transmission line are $R= 60\text{hms/km}$, $L=2.2\text{m H/km}$, $C=0.005\times 10^{-6}$ and $G=0.25\times 10^{-6}$ mho/km. Determine the characteristics impedance and propagation constant at 1000 Hz.

9. Derive the expression for the input impedance of a transmission line Hence obtain the input impedance for a loss less line.
10. write a short note on reflection factor and reflection loss.
11. Derive the expression for the input impedance of a loss less line.
12. Draw the L-type equivalent circuit model of a two-conductor transmission line and derive the transmission line equations.
13. Discuss the reflection coefficient of different transmission lines.
14. A transmission line operating at 10^6 rad/s has $\alpha = 8$ dB/m, $\beta = 1$ rad/m. and $Z_0 = 60 + j40$ ohms, and is 2 meter long. The line is connected to a source of 10 v, $Z_g = 40$ ohms and terminated by a load of $20 + j50$ ohms. Determine the current at the middle of the line.
15. A low loss transmission line of 100 ohms characteristic impedance is connected to a load of 200 ohm. Calculate the voltage reflection coefficient and the standing wave ratio.
16. Discuss the theory of open and short circuited lines with voltage and current distribution diagram and also get the input impedance expression.
17. A transmission line has the following per unit length parameters : $L = 0.1 \mu$ H, $R = 5$ ohms, $C = 300$ pF and $G = 0.01$ mho. Calculate the propagation constant.

UNIT II HIGH FREQUENCY TRANSMISSION LINES

2 MARKS:

1. **State the assumptions for the analysis of the performance of the radio frequency line.**
 - a. Due to the skin effect, the currents are assumed to flow on the surface of the conductor. The internal inductance is zero.
 - b. The resistance R increases with square root of f while inductance L increases with f . Hence $\omega L \gg R$.
 - c. The leakage conductance G is zero.
2. **State the expressions for inductance L of a open wire line and coaxial line.**
 - a. For open wire line ,
 - b. $L = 9.21 \times 10^{-7} (\mu/\mu_r + 4 \ln d/a) = 10^{-7} (\mu_r + 9.21 \log d/a)$ H/m
 - c. For coaxial line, $L = 4.60 \times 10^{-7} [\log b/a]$ H/m
3. **State the expressions for the capacitance of a open wire line For open wire line.**

$$C = (12.07) / (\ln d/a) \mu\text{f/m}$$
4. **What is dissipationless line?**
A line for which the effect of resistance R is completely neglected is called dissipationless line .
5. **What is the nature and value of Z_0 for the dissipation less line?**
For the dissipation less line, the Z_0 is purely resistive and given by, $Z_0 = R_0 = (L/c)^{1/2}$
6. **State the values of α and β for the dissipation less line.**
Answer:
 $\alpha = 0$ and $\beta = \omega (LC)^{1/2}$
7. **What are nodes and antinodes on a line?**

The points along the line where magnitude of voltage or current is zero are called nodes while the the points along the lines where magnitude of voltage or current first maximum are called antinodes or loops.

8. What is standing wave ratio?

The ratio of the maximum to minimum magnitudes of voltage or current on a line having standing waves called standing waves ratio.

9. What is the range of values of standing wave ratio?

The range of values of standing wave ratio is theoretically 1 to infinity.

10. State the relation between standing wave ratio and reflection coefficient.

Ans: $S = \frac{1+|K|}{1-|K|}$

11. What are standing waves?

If the transmission is not terminated in its characteristic impedance, then there will be two waves traveling along the line which gives rise to standing waves having fixed maxima and fixed minima.

12. What is called standing wave ratio?

The ratio of the maximum to minimum magnitudes of current or voltage on a line having standing wave is called the standing-wave ratio S.

13. State the relation between standing wave ratio S and reflection coefficient k.

The relation between standing wave ratio S and reflection coefficient k is,

i. $S = \frac{1+|K|}{1-|K|}, k = \frac{S-1}{S+1}$

14. How will you make standing wave measurements on coaxial lines?

For coaxial lines it is necessary to use a length of line in which a longitudinal slot, one half wavelength or more long has been cut. A wire probe is inserted into the air dielectric of the line as a pickup device, a vacuum tube voltmeter or other detector being connected between probe and sheath as an indicator. If the meter provides linear indications, S is readily determined. If the indicator is non linear, corrections must be applied to the readings obtained.

15. Give the input impedance of a dissipationless line.

The input impedance of a dissipationless line is given by,

16. Give the maximum and minimum input impedance of the dissipationless line.

- a. Maximum input impedance
- b. Minimum input impedance

17. Give the input impedance of open and short circuited lines.

The input impedance of open and short circuited lines are given.

18. Why the point of voltage minimum is measured rather than voltage maximum?

The point of a voltage minimum is measured rather than a voltage maximum because it is usually possible to determine the exact point of minimum voltage with greater accuracy.

19. What is the use of eighth wave line?

An eighth wave line is used to transform any resistance to an impedance with a magnitude equal to R_o of the line or to obtain a magnitude match between a resistance of any value and a source of R_o internal resistance.

20. Give the input impedance of eighth wave line terminated in a pure resistance

R_r . The input impedance of eighth wave line terminated in a pure resistance R_r . Is given by $Z_s = (ZR + jR_o/R_o + jZR)$. From the above equation it is seen that $|Z_s| = R_o$.

21. Why is a quarter wave line called as impedance inverter?

A quarter wave line may be considered as an impedance inverter because it can transform a low impedance into a high impedance and vice versa.

22. What is the application of the quarter wave matching section ?

An important application of the quarter wave matching section is to couple a transmission line to a resistive load such as an antenna. The quarter wave matching section then must be designed to have a characteristic impedance R_o so chosen that the antenna resistance R_a is transformed to a value equal to the characteristic impedance R_o of the transmission line. The characteristic impedance R_o of the matching section then should be $R_o = (R_a R_o)^{1/2}$.

23. What do you mean by copper insulators?

An application of the short circuited quarter wave line is wire line or the center conductor of a coaxial line. This application makes use of the fact that the input impedance of a quarter wave shorted line is very high, such lines are sometimes referred to as copper insulators.

24. Bring out the significance of a half wavelength line.

A half wavelength line may be considered as a one- to one transformer. It has its greatest utility in connecting load to a source in cases where the load source cannot be made adjacent.

25. Give some of the impedance matching devices.

The quarter wave line or transformer and the tapered line are some of the impedance matching devices.

26. Explain impedance matching using stub.

In the method of impedance matching using stub, an open or closed stub line of suitable length is used as a reactance shunted across the transmission line at a designated distance from the load, to tune the length of the line and the load to resonance with an antiresonant resistance equal to R_o .

27. Give reasons for preferring a short-circuited stub when compared to an open circuited stub.

A short circuited stub is preferred to an open circuited stub because of greater ease in constructions and because of the inability to maintain high enough insulation resistance at the open circuit point to ensure that the stub is really open circuited. A shorted stub also has a lower loss of energy due to radiation, since the

short circuit can be definitely established with a large metal plate, effectively stopping all field propagation.

- 28. What are the two independent measurements that must be made to find the location and length of the stub?**

The standing wave ratio S and the position of a voltage minimum are the independent measurements that must be made to find the location and length of the stub.

- 29. Give the formula to calculate the distance of the point from the load at which the stub is to be connected.**

The formula to calculate the distance of the point from the load at which the stub is to be Connected is, $S1 = (\phi + \pi - \cos^{-1}|K|)/(2\beta)$

- 30. Give the formula to calculate the distance d from the voltage minimum to the point stub be connection.**

The formula to calculate the distance d from the voltage minimum to the point of stub be connection is, $d = \cos^{-1}|K| / (2\beta)$

16 MARKS:

1. Explain the application of smith chart A 30 m long loss less transmission line with $Z_0=50\text{ohms}$ operating at 2 MHz is terminated with a load $Z_L=60+j40\text{ohms}$ if $U=0.6C$ find the reflection coefficient γ , the standing wave ratios and the input impedance.
2. i) Derive the expression that permit easy measurement of power flow on a line of negligible losses.
3. ii) Derive the expression for input impedance of open and short circuited lines.
4. Discuss the various parameters of open wire and co axial lines at radio frequency.
5. (i) An ideal loss less quarter wave transmission line of characteristics impedance 60ohms is terminated in a load impedance Z_L . Give the value of the input impedance of the line when
6. $Z_L=0, \infty$ and 60ohm .
7. 5.i) A 100ohm , 200 m long loss less line transmission line operators at 10 MHz and its terminated into an impedance of $50-j200\text{ohm}$ the transit time is $1\mu\text{s}$. Determine the length and location of short circuited stub line
8. 6. (i) Draw and explain the operation of quarter wave line.
9. It is required to match a 200 ohms load to a 300 ohms transmission line to reduce the SWR along the line to 1. What must be the characteristic impedance of the quarter wave transformer used for this purpose if it is directly connected to the load?
10. What are the drawbacks of single stub matching and open circuited stubs?
11. i) Derive equation of attenuation constant and phase constant of transmission line in terms of line constants R, L, C and G and explain the significance of reflection coefficient and insertion loss.

12. A generator of 1v, 1kHz supplies power to a 100km open wire line terminated in 200 ohms resistance The line parameter are $R= 10\text{ohm/km}$, $L=3.8 \text{ Mh/km}$ $G= 1\times 10 \text{ mho/km}$.
 $c=0.0085$
13. $\mu\text{F/km}$ calculate the impedance, reflection coefficient power and transmission efficiency.
14. Explain the parameters of open wire line and co axial at RF. Mention the standard assumptions made for radio frequency line.
15. Derive the expressions for the input impedance of the dissipation less line. Deduce the input impedance of open and short circuited dissipation less line.

UNIT-III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES

2 MARKS:

1. Give the formula to calculate the length of the short circuited stub.

- a. The formula to calculate the length of the short circuited stub is, $L=\lambda/2\pi \tan^{-1}((s)^{1/2}/(s-1))$
- b. This is the length of the short . circuited stub to be placed d meters towards the load from a point at which a voltage minimum existed before attachment of the stub.

2. What is the input impedance equation of a dissipation less line ?

The input impedance equation of a dissipation less line is given by
 $(Z_s/R_o)=(1+|K|(\phi-2\beta s)/(1-|K|(\phi-2\beta s))$

3. Give the equation for the radius of a circle diagram.

The equation for the radius of a circle diagram is $R=(S^2-1)/2S$ and $C = (S^2+1)/2S$.
 Where C is the shift of the center of the circle on the positive Ra axis.

4. What is the use of a circle diagram?

The circle diagram may be used to find the input impedance of a line m of any chosen length.

5. How is the circle diagram useful to find the input impedance of short and open circuited lines?

An open circuited line has $s =\alpha$ the correspondent circle appearing as the vertical axis .The input impedance is then pure reactance , with the value for various electrical lengths determined by the intersections of the corresponding βs circles with the vertical axis. A short circuited line may be solved by determining its admittance .The S circle is again the vertical axis, and suceptance values may be read off at appropriate intersection of the βs circles with the vertical axis.

6. List the applications of the smith chart.

The applications of the smith chart are,

- (i) It is used to find the input impedance and input admittance of the line.
- (ii) The smith chart may also be used for lossy lines and the locus of points on a line then follows a spiral path towards the chart center, due to attenuation.
- (iii) In single stub matching

7. What are the difficulties in single stub matching?

The difficulties of the smith chart are

- (i) Single stub impedance matching requires the stub to be located at a definite point on the line. This requirement frequently calls for placement of the stub at an undesirable place from a mechanical view point.
- (ii) For a coaxial line, it is not possible to determine the location of a voltage minimum without a slotted line section, so that placement of a stub at the exact required point is difficult.
- (iii) In the case of the single stub it was mentioned that two adjustments were required ,these being location and length of the stub.

8. What is double stub matching?

Another possible method of impedance matching is to use two stubs in which the locations of the stub are arbitrary, the two stub lengths furnishing the required adjustments. The spacing is frequently made $\lambda/4$. This is called double stub matching.

9. Give reason for an open line not frequently employed for impedance matching.

An open line is rarely used for impedance matching because of radiation losses from the open end, and capacitance effects and the difficulty of smooth adjustment of length.

10. State the use of half wave line .

The expression for the input impedance of the line is given by $Z_s = Z_r$ Thus the line repeats its terminating impedance .Hence it is operated as one to one transformer .Its application is to connect load to a source where they can not be made adjacent.

11. Why Double stub matching is preferred over single stub matching.

Double stub matching is preferred over single stub due to following disadvantages of single stub. Single stub matching is useful for a fixed frequency. So as frequency changes the location of single stub will have to be changed. The single stub matching system is based on the measurement of voltage minimum .Hence for coaxial line it is very difficult to get such voltage minimum, without using slotted line section.

16 MARKS:

1. i) Discuss the application of quarter wave line in impedance matching and copper insulator.
ii) A 30 m long lossless transmission line with characteristic impedance Z_0 of 50Ω is terminated by a load impedance $Z_L = 60 + j 40\Omega$ The operating wavelength is 90 m. Find the reflection coefficient, standing wave ration and input impedance using SMITH chart.
2. A 50Ω transmission line is connected to a load impedance $Z_L = 60 + j80\Omega$. The operating frequency is 300MHz A double stub matching an eight of a wave length apart is used to match the load to the line find the required lengths of the short circuited stubs using SMITH chart.
3. i) A 75Ω lossless transmission line is to be matched to a resistive load impedance of $Z_L = 100\Omega$ via a quarter wave section find the characteristic impedance of the quarter wave transformer.

4. ii) A 50Ω lossless transmission line is terminated in a load impedance of $Z_L=(25+j50)\Omega$ Use the SMITH chart to find
 - (1). Voltage reflection coefficient.
 - (2). VSWR
 - (3). Input impedance of the line given that the line is 3.3 wavelength long and.
 - (4). Input admittance of the line.
5. A 50Ω lossless line feeder line is to be matched to an antenna with $Z_L=(75-j20)\Omega$ at 100MHz using single stub . calculate the stub length between the antenna and stub using SMITH chart.
6. Discuss the operation of a quarter wave line and illustrate its application.
7. A lossless line in air having a characteristic impedance of 300 ohms is terminated by unknown impedance. The first voltage minimum is located at 15 cm from the load the standing wave ratio is 3.3. Calculate the wavelength and terminating impedance.
8. A load having an impedance $(450-j600)$ ohms at 10MHz is connected to a 300ohms line calculate the position and length of a short circuited stub to match this load to the line using SMITH chart.
9. A $100 + j50$ ohms is connected to a 75 ohms lossless line. Find the reflection coefficient, load admittance and input impedance at the generator using smith chart.
10. Explain the realization of quarter wave transformer.
11. Explain the technique of single stub matching and discuss operation of quarter wave transformer.
12. Draw and explain the principle of double stub matching.
13. A UHF lossless transmission line working at 1 GHz is connected to an unmatched line producing a voltage reflection coefficient of $0.5(0.866 + j 0.5)$. Calculate the length and position of the stub to match the line.
14. Discuss double stub matching.
15. Show that the incident and reflected waves combine to produce a standing wave.

UNIT IV PASSIVE FILTERS

2 MARKS:

1. What is filter?

Electronic filters are electronic circuits which performs signal processing functions. Specifically to remove unwanted frequency components from the signal, to enhance wanted once or both.

2. What are passive filters?

Passive implementation of linear filters are based on combination of resistor, capacitor, inductor. These types are collectively known as passive filters, because they do not depend upon an external power supply and/or they do not contain active components such as transistor.

3. What are active filters?

Active filters are implemented using a combination of passive and active components, and required an outside power source. Operational amplifier is frequently used in active filters designs.

4. What are the characteristics of ideal filters?

Ideal filter would have zero attenuation in pass band and infinite attenuation in the stop band.

5. What is a symmetrical network?

When the electrical properties of the networks are not effected even after interchanging input and output terminals the network is called as symmetrical network. A network is said to be symmetrical if two series arms of a T network or shunt arms of a Π network are equal.

6. Define characteristic impedance of a symmetrical network?

Characteristic impedance of a symmetrical of a symmetrical network is the impedance measured at the input terminals of the first network in a chain of infinite networks in cascade and is denoted as Z_0 .

7. What is constant k filters.

A filter in which the series arm impedance Z_1 and arm shunt arm impedance Z_2 satisfy the relationship between $Z_1.Z_2=RK$. Is called constant k filter, where Rk is a real constant independent of frequency.

8. What is importance of terminating half section?

- Terminating half section are normally added to any filter to provide uniform terminated and matching characteristics.
- They provide a point of high attenuation at a frequency 1.25 times that of cut off. Thus improving the attenuation the attenuation characteristic of the filter.

9. What is one Neper equal to?

1 Neper = 8.686 db.

10. Why constant k filters are also known as proto type filters?

Constant k filters are also known as proto type filters because other complicated networks can be derived from it.

11. Define Neper.

The natural logarithmic of the ratio of input current or voltage to the output current or voltage is expressed in neper.

$$N = \ln [v/v_2] = \ln [I_1/I_2].$$

12. Give relationship between decibel and neper.

One neper = 8.686 db.

One db = 0.115 nepers.

13. What are the advantages of m-derived filters?

- Attenuation rises sharply at cutoff frequency.
- In the pass band output of the filter remains constant which means the characteristic impedance remains constant throughout the pass band.

15. What is the significant of propagation constant in symmetrical network?

The current ratio or voltage ratio is expressed as v_1/v_2 (or) i_1/i_2 .

Propagation constant $\gamma = \alpha + j\beta$.

Where α is the attenuation constant

β is the phase constant.

16. Define cut off frequency of a filter?

The frequency at which the network changes from a pass band to stop band is called cut off frequency.

$$Z_1/4Z_2 = 0 \text{ or } z = 0$$

$$Z_1/4Z_2 = -1 \text{ Or } Z_1 = -4Z_2.$$

16 MARKS:

1. i) Derive the relevant equation of m-derived low pass filter and design m-derived T-type low pass filter to work into load of 500ohms with cut off frequency at 4kHz and peak attenuation at 4.15kHz.
2. Explain the structure and application of crystal filter design a low pass filter with cut off frequency 2600 Hz to match 550 ohms use one derived section with infinite attenuation at 2850Hz.
3. Derive the equation for the characteristics impedance of symmetrical T and II networks.
4. Discuss the properties of symmetrical network in terms of characteristics impedance and propagation constant.

5. With suitable filter section design constant K low pass and high pass filter.
6. Calculate the values of the inductor and capacitor of a prototype constant k low pass filter
composed of Π section to operate with a terminating load of 600ohms and to have a cut off frequency of 3 KHz.
7. Construct a band stop constant k filter?
8. Discuss the characteristics of symmetrical network?
9. Design an m derived T section low pass filter having cut off frequency $f_c = 1000\text{Hz}$ design impedance $R_k = 600\text{ohms}$ and frequency of infinite attenuation $f_\infty = 1050\text{ Hz}$.
10. Design a m-derived T-section low pass filter having a cutoff frequency (f_c) of 5000 Hz and a design impedance of 600 ohms. The frequency of infinite attenuation is $1.25 f_c$.
11. Draw and explain the operation of crystal filters.
12. Design a constant-K T-section bandpass filter with cutoff frequencies of 1 KHz and 4 KHz. The design impedance is 600 ohms.
13. Draw a constant-K T-section band elimination filter and explain the operation with necessary design equations.
14. Design a constant K band pass filter deriving expressions for the circuit components. A constant High pass filter cut off frequency of 2300 Hz. The load resistance is 500 ohm. Calculate the values of the components used in filter
15. Design a composite High pass filter to operate into the load of 600 ohm and have a cutoff frequency of 1.2Khz. The filter is have one constant k section, one m derived section with $f_\infty = 1.1\text{KHz}$ and suitably terminated half section. Discuss the merits and demerits of the m derived filter and crystal filter.

UNIT 5

WAVE GUIDES AND CAVITY RESONATORS

2 MARKS:

1. What are guided waves? Give examples

The electromagnetic waves that are guided along or over conducting or dielectric surface are called guided waves. Examples: Parallel wire, transmission lines

2. What is TE wave or H wave?

Transverse electric (TE) wave is a wave in which the electric field strength E is entirely transverse. It has a magnetic field strength H_z in the direction of propagation and no component of electric field E_z in the same direction

3. What is TH wave or E wave?

Transverse magnetic (TM) wave is a wave in which the magnetic field strength H is entirely transverse. It has a electric field strength Ez in the direction of propagation and no component of magnetic field Hz in the same direction.

4. What is a TEM wave or principal wave?

TEM wave is a special type of TM wave in which an electric field E along the direction of propagation is also zero. The TEM waves are waves in which both electric and magnetic fields are transverse entirely but have no components of Ez and Hz. it is also referred to as the principal wave.

5. What is a dominant mode?

The modes that have the lowest cut off frequency is called the dominant mode.

6. Give the dominant mode for TE and TM waves

Dominant mode: TE10 and TM10

7. What is cut off frequency?

The frequency at which the wave motion ceases is called cut-off frequency of the waveguide.

8. What is cut-off wavelength?

It is the wavelength below which there is wave propagation and above which there is no wave propagation.

9. Write down the expression for cut off frequency when the wave is propagated in between two parallel plates.

The cut-off frequency, $f_c = m / (2a (\mu E)^{1/2})$

10. Mention the characteristics of TEM waves.

It is a special type of TM wave
It doesn't have either E or H component
Its velocity is independent of frequency
Its cut-off frequency is zero.

11. Define attenuation factor

Attenuation factor = (Power lost/ unit length)/(2 x power transmitted)

12. Give the relation between the attenuation factor for TE waves and TM waves

$\alpha_{TE} = \alpha_{TM} (f_c/f)^2$

13. Define wave impedance

Wave impedance is defined as the ratio of electric to magnetic field strength

$Z_{xy} = E_x / H_y$ in the positive direction

$Z_{xy} = -E_x / H_y$ in the negative direction

14. What is a parallel plate wave guide?

Parallel plate wave guide consists of two conducting sheets separated by a dielectric material.

15. Why are rectangular wave-guides preferred over circular wave-guides?

Rectangular wave-guides preferred over circular wave guides because of the following reasons.

16. Rectangular wave guide is smaller in size than a circular wave guide of the same operating frequency

It does not maintain its polarization through the circular wave guide

The frequency difference between the lowest frequency on dominant mode and the next mode of a rectangular wave-guide is bigger than in a circular wave guide.

17. Mention the applications of wave guides

The wave guides are employed for transmission of energy at very high frequencies where the attenuation caused by wave guide is smaller. Waveguides are used in microwave transmission. Circular waveguides are used as attenuators and phase shifters

18. Why is circular or rectangular form used as waveguide?

Waveguides usually take the form of rectangular or circular cylinders because of its simpler forms in use and less expensive to manufacture.

19. What is an evanescent mode?

When the operating frequency is lower than the cut-off frequency, the propagation constant becomes real i.e, $\gamma = \alpha$. The wave cannot be propagated. This non-propagating mode is known as evanescent mode.

20. What is the dominant mode for the TE waves in the rectangular waveguide?

The lowest mode for TE wave is TE₁₀ (m=1, n=0)

21. What is the dominant mode for the TM waves in the rectangular waveguide?

The lowest mode for TM wave is TM₁₁ (m=1, n=1)

22. What is the dominant mode for the rectangular waveguide?

The lowest mode for TE wave is TE₁₀ (m=1, n=0) whereas the lowest mode for TM wave is TM₁₁ (m=1, n=1). The TE₁₀ wave have the lowest cut off frequency compared to the TM₁₁ mode. Hence the TE₁₀ (m=1, n=0) is the dominant mode of a rectangular waveguide. Because the TE₁₀ mode has the lowest attenuation of all modes in a rectangular waveguide and its electric field is definitely polarized in one direction everywhere.

23. Which are the non-zero field components for the for the TM₁₁ mode in a rectangular waveguide?

H_x, H_y, E_y. and E_z.

24. Define characteristic impedance in a waveguide

The characteristic impedance Z₀ can be defined in terms of the voltage-current ratio or in terms of power transmitted for a given voltage or a given current. $Z_0 (V,I) = V/I$

25. Why TEM mode is not possible in a rectangular waveguide?

Since TEM wave do not have axial component of either E or H ,it cannot propagate within a single conductor waveguide

26. Explain why TM₀₁ and TM₁₀ modes in a rectangular waveguide do not exist.

For TM modes in rectangular waveguides, neither m or n can be zero because all the field equations vanish (i.e., H_x, H_y, E_y. and E_z.=0). If m=0,n=1 or m=1,n=0 no fields are present. Hence TM₀₁ and TM₁₀ modes in a rectangular waveguide do not exist.

27. What are degenerate modes in a rectangular waveguide?

Some of the higher order modes, having the same cut off frequency , are called degenerate modes. In a rectangular waveguide , TE_{mn} and TM_{mn} modes (both m ≠0 and n≠ 0) are always degenerate.

28. What are the performance parameters of microwave resonator?

The performance parameters of microwave resonator are:

- Resonant frequency
- Quality factor
- Input impedance

29. What is resonant frequency of microwave resonator?

Resonant frequency of microwave resonator is the frequency at which the energy in the resonator attains maximum value. i.e., twice the electric energy or magnetic energy.

30. Define quality factor of a resonator.

The quality factor Q is a measure of frequency selectivity of the resonator. It is defined as

$Q = 2 \pi \times \text{Maximum energy stored} / \text{Energy dissipated per cycle} = \omega W / P$ Where W is the maximum stored energy P is the average power loss

31. What is a resonator?

Resonator is a tuned circuit which resonates at a particular frequency at which the energy stored in the electric field is equal to the energy stored in the magnetic field.

32. How the resonator is constructed at low frequencies?

At low frequencies upto VHF (300 MHz) , the resonator is made up of the reactive

elements or the lumped elements like the capacitance and the inductance.

33. What are the disadvantages if the resonator is made using lumped elements at high frequencies?

The inductance and the capacitance values are too small as the frequency is increased beyond the VHF range and hence difficult to realize .

34. What are the methods used for constructing a resonator?

- The resonators are built by
- using lumped elements like L and C
- using distributed elements like sections of coaxial lines
- using rectangular or circular waveguide

35. What is a transmission line resonator or coaxial resonator?

Transmission line resonator can be built using distributed elements like sections of coaxial lines. The coaxial lines are either opened or shunted at the end sections thus confining the electromagnetic energy within the section and acts as the resonant circuit having a natural resonant frequency.

36. Why transmission line resonator is not usually used as microwave resonator?

At very high frequencies transmission line resonator does not give very high quality factor Q due to skin effect and radiation loss. So, transmission line resonator is not used as microwave resonator

16 MARKS:

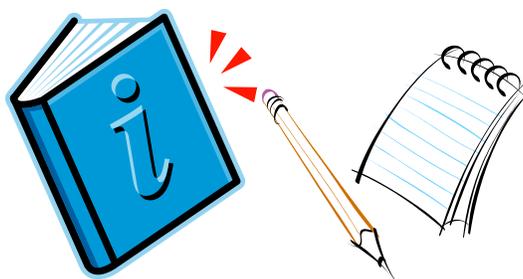
1. i) Derive the expression for TM wave components in wave guides using Bessel function. ii) Write the brief note on excitation of modes in circular wave guides.
2. Derive the equation for Q-factor of rectangular cavity resonator for TE_{101} mode.
3. Derive the TM wave components in circular wave guide using Bessel function?
4. Calculate the resonant frequency of an air filled rectangular resonator of dimensions $a=3\text{cm}$, $b=2\text{cm}$, $d=4\text{cm}$ operating in TE_{101} mode.
5. Derive the solution of field equation using cylindrical co-ordinates.
6. Draw the field configuration of different TM and TE modes for a circular guide.
7. A circular air filled copper cavity is excited in the TM_{010} mode at 9.375 GHz. The cavity has ratio length radius = 1.5. Find the Q-factor.
8. Derive expressions for the field components existing in a rectangular cavity.
9. Discuss the propagation of TM waves in a circular waveguide with relevant expression for the field components.

10. Explain the field components of the TE waves in a rectangular cavity resonator with relevant expression.
11. Calculate the cutoff wavelength, guide wavelength and characteristic wave impedance of a circular wave guide with an internal diameter of 4 cm for a 10 GHz signal propagated in it in the TE_{11} mode.
12. A rectangular wave guide with dimension $a=2.5\text{cm}$, $b=1\text{cm}$ is to operate below 15 GHz. How many TE and TM modes can the wave guide transmit if the guide is filled with a medium characterized by $\sigma=0$, $\epsilon=4\epsilon_0$, $\mu_r=1$? Calculate the cutoff frequency of the modes.
13. Discuss the propagation of TM waves in a rectangular waveguide with relevant expressions and diagrams for the field components.
14. A rectangular waveguide measuring $a = 4.5\text{ cm}$ and $b = 3\text{ cm}$ internally has a 9 GHz signal propagated in it. Calculate the guide wavelength, phase and group velocities and characteristic impedance for the dominant mode.



V.S.B.ENGINEERING COLLEGE, KARUR-639 111

Department of Chemistry



GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING

QUESTION BANK

PART-A QUESTIONS AND ANSWERS

Prepared by
Department of Chemistry
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UNIT-I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Environment

PART-A

1. Define environment.

'Environment' is derived from the French word *Environ* which means to encircle or surround. All the biological and non-biological things surrounding an organism are thus included in environment. Thus environment is sum total of water, air and land, inter-relationships among themselves and also with the human beings, other living organisms and property.

2. Write down the components of environment. (May-June 2013) (Nov-Dec 2014)

The components of environment can be broadly divided into two

- a) **Abiotic components** - composed of all the non living components like temperature, water, minerals and gases etc. It includes 1. Lithosphere 2. Hydrosphere 3. Atmosphere
- b) **Biotic components** - composed of all the living components (plants, animals & micro-organisms) It includes 1. Producers 2. Consumers 3. Decomposers

3. Write the classification of biological environment.

Floral/Plant Environment

Faunal /Animal Environment

Microbial environment

4. What is hazard?

Hazard is any substance that can hurt you or make you ill. It is expressed in degree. Degree of hazard is the function of risk, exposure, vulnerability and response.

5. Give some important physical hazards and their health effects. Or Give any two examples of physical hazards. (May - June 2016)

Physical hazards	Health effects
Radioactive radiations	Affect the cells, function of glands and organs and cancer.
UV radiations	Skin cancer.
Global warming	Increase in temperature causes famine, mortality.
Noise	Painful and irreparable damage to human ear.

6. Mention some important chemical hazards and their health effects. (Nov-Dec 2016)

Chemical hazards	Health effects
Combustion of fossil fuels: Liberates SO ₂ , NO ₂ , CO ₂ and particulate matter.	Asthma, bronchitis and other lung diseases.
Industrial effluents(toxic)	Kill cells and cause cancer, and death.
Pesticides like DDT and chlorinated pesticides	Affect the food chain
Heavy metals like Hg, Cd, Pb, fluoride and nitrate.	Contaminate water, cause ill effects.

7. How are hazards controlled?

Ventilation of the places should be improved.

Use of UV lamp and air conditioning systems.

Use of personal protective equipment like masks, gloves, protective clothes, eye shield.

Elimination of the sources of contamination of biological hazards.

ECOSYSTEMS

1. What are the components of Eco system?

An Eco system has two major components.

Biotic (or) Living components

Abiotic (or) Non living components

2. What are nutrient cycles (or) Bio-geochemical cycle?

The cycle flow of nutrients between the biotic and abiotic components is known as Nutrient cycle (or) biogeochemical cycle

3. What is hydrological cycle? (Nov-Dec 2013)

The process of Evaporation, Condensation and Transpiration is known as hydrological cycle.

4. What is ecological succession? Mention their types. (Nov-Dec 2013)

The progressive replacement of one community by another till the development of Stable community in a particular area is called ecological succession.

Types:

a) Primary succession

i) Hydrosere ii) Xerosere

b) Secondary succession

5. Why are plants called as producers?

The green plants have chlorophyll with the help of which they trap solar energy and change it into chemical energy of carbohydrates using simple inorganic compounds namely water and carbon dioxide. As the green plants manufacture their own food they are known as Autotrophy.

6. What are food chains?(April-May2015) (Nov-Dec 2015)

The sequence of eating and being eaten in an ecosystem is known as food chains

7. What is food web?

The interlocking pattern of various food chains in an ecosystem is known as food web.

8. What is ecological pyramid?

Graphical representation of structure and function of tropic levels of an ecosystem starting with producers at the bottom and each successive tropic levels forming the apex is known as ecological pyramids.

9. What are called Producers?

Producers are mainly the green plants, which can synthesize their food themselves by making use of CO₂ present in the air and water in the presence of sunlight by involving chlorophyll, through the process of photosynthesis. They are also known as photo autotrophs.

10. Name the four ecosystems.

- Forest ecosystems
- Grass land ecosystems
- Desert ecosystems
- Pond ecosystems

11. Explain the concept of an ecosystem. (Nov-Dec 2013)

A group of organisms interacting among themselves and with environment is known as ecosystem.

12. Define the terms a) Producers and b) Consumers.

- a) Producers synthesis their food themselves through photosynthesis.
- b) Consumers are organisms which cannot prepare their own food and depends on food directly or indirectly on the producers.

13. What is meant by keystone species?(or)Define keystone species with suitable example. (April-May2018)

With in a habitat each species connects to and depends on other species. But while each species contribute to habitat functioning, some species do more than others in the overall scheme of things. Without the work of these key species, the habitat changes significantly. These Species are called keystone species. When a keystone species disappears from its habitat, that Habitat changes dramatically. e.g. Elephant in forest eco system. Elephant is strong enough to digest large size fruits from tallest tree. If elephant is not existed, tallest tree will be extinct species

14. What are the characteristics of desert ecosystem?

- Air and climate is dry is hot.
- Soil is poor nutrients and organic matter.
- Annual rain fall is less than 25 cm.
- Vegetation is poor

15. What are autotrophic and heterotrophic components of an ecosystem? Give examples.

Autotrophic component: The members of autotrophic components are producers which are autotrops (self – nourishing organisms). They derive energy from sun light and make organic components from inorganic substances. Eg: Green plants, Algae, Bacteria etc

Heterotrophic components: The members of heterotrophic components are consumers and decomposers, which are heterotrops (depend on others for food). They consume autotrops (Producers).

16. Define primary production and secondary production.

Primary production: It is defined as the conversion of radiant energy into organic substances by photosynthesis by the primary producers (Plants)

Secondary production: .It is defined as distribution of energy in the form of food to the consumer (or) the energy stored by the consumer.

17. How does biome differ from an ecosystem?

The kind of organisms which can live in a particular ecosystem depends on their physical and metabolic adoptions to the environment of that place. On earth there are many sets of ecosystems which are exposed to same climatic conditions and having dominant species with similar life cycle, climatic adoptions and physical structure. This set of ecosystem is called a biome.

18. Define decomposer and give their significance.

The microorganism which feeds on dead organs is known as decomposer. Examples: bacteria and fungi.

19. Define ecology. (May-June 2014)

Ecology is the scientific study of interactions among organisms and their environment.

20. Mention two and secondary consumers in grassland ecosystem. (May-June 2016)

Primary consumers – Giraffe, Deer.

Secondary consumers – Snake, Lizard.

21. How is nitrogen fixed in soil? (April-May 2017)

They contain symbiotic bacteria called rhizobia within nodules in their root systems, producing nitrogen compounds that help the plant to grow and compete with other plants. When the plant dies, the fixed nitrogen is released, making it available to other plants; this helps to fertilize the soil.

22. Define the ecosystem. (April-May2018)

A group of organism interacting among themselves and with environment is known as ecosystem.

23. Write the various adaptive features of desert plants. (April-May2018)

- ✓ Ability to collect and store water and
- ✓ Features that reduce water loss

24. What are indicator species? Give example. (April-May2018)

An indicator species is an organism whose presence, absence or abundance reflects a specific environmental condition. Indicator species can signal a change in the biological condition of a particular ecosystem, and thus may be used as a proxy to diagnose the health of an ecosystem. For example, plants or lichens sensitive to heavy metals or acids in precipitation may be indicators of air pollution

BIODIVERSITY

1. What is In-situ conservation? (Nov-Dec 2017)

It involves protection of fauna and flora within its natural habitat, where the species normally occurs is called in-situ conservation.

2. What is Ex-situ conservation? (Nov-Dec 2017)

It involves protection of fauna and flora from the outside natural habitats.

3. Enumerate the human activities which destroy the biodiversity.

- The farmers prefer hybrid seeds; as a result, many plant species become extinct.
- For the production of drugs, pharmaceutical companies collect medicinal plants, become extinct.
- Tropical forest is the main sources of world's medicine. Every year these forests are disappearing due to agriculture, mining, logging.

4. Define the terms a) genetic diversity and b) species diversity (April-May 2017)

a) Genetic diversity: It is the diversity within species

b) Species diversity: It is the diversity between different species. The sum of varieties of all the living organisms at the species level is known as species diversity.

5. What do you understand by the terms flora and fauna?

Flora: Plants present in a particular region or period.

Fauna: Animal present in a particular region or period.

6. India is a mega diversity nation-Account.

India is one among the 12 mega diversity countries in the world. It has 89450 animal species accounting for 7.31% of the global faunal species and 47000 plants species accounting for 10.8% of the global floral species. The loss of biodiversity is about 33%.

7. What are the two important bio-diversity hot spots in India?

1. Eastern Himalayas
2. Western Ghats

8. Give few examples for endangered and endemic species.

Endangered species:

- Reptiles : Tortoise, Python.
Mammals : Indian wolf, Red fox, Tiger.
Primates : Golden monkey.

Plants : Santalum.

Endemic species:

Flora: Sapria Himalayan, Ovaria lusida
Fauna: Monitor lizards, Indian salamander

9. Define biodiversity and mention its significance. (April-May2015) (Nov-Dec 2015)

It is defined as the variety and variability among all groups of living organism and the ecosystem in which they occur.

Significance:

- It is very important for human life, as we depend on plants, microorganisms, earth's animals for our food, medicine and industrial products.
- It protects the fresh air, clean water and productive land.

10. Write the classification of biodiversity. (May-June 2014) (Nov-Dec 2016)

The concept of biodiversity may be analyzed in 3 different levels.

1. Ecosystem diversity
2. Species diversity
3. Genetic diversity

Ecosystem diversity: (Nov-Dec 2016)

- The richness and complexity of a biological community, including tropic levels, ecological processes food webs and material recycling.

Species diversity:

- The number of kinds of organisms within individual communities or ecosystems.

Genetic diversity:

- It is a measure of the variety of versions of same gene within individual species.

11. What are called endangered species? (Nov-Dec 2014) (Nov-Dec 2017)

A species said to be endangered species, when its number has been reduced to a critical level. Unless it is protected and conserved it is in immediate danger of extinction.

12. What are the major threats to biodiversity? (Nov-Dec 2014)

- Habitat loss.
- Poaching.
- Man – wild conflicts.

13. Explain vulnerable species.

A species said to be vulnerable species when its population is facing continuous decline due to habitat destruction or over exploitation. Such a species is still abandoned.

14. Write a note on nitrogen cycle. (Nov-Dec 2017)

The nitrogen cycle is the biogeochemical cycle by which nitrogen is converted into various chemical forms as it circulates among the atmosphere, terrestrial, and marine ecosystems. The conversion of nitrogen can be carried out through both biological and physical processes. Important processes in the nitrogen cycle include fixation, ammonification, nitrification, and denitrification. The majority of Earth's atmosphere (78%) is nitrogen, making it the largest source of nitrogen. However, atmospheric nitrogen has limited availability for biological use, leading to a scarcity of usable nitrogen in many types of ecosystems.

15. Mention two invasive species. (Nov-Dec 2017)

An invasive species is a plant, fungus, or animal species that is not native to a specific location (an introduced species), and which has a tendency to spread to a degree believed to cause damage to the environment, human economy or human health

Eg. Flat worms, jelly fish, bony fish, sharks, rays, amphibians, reptiles.

16. What are called endemic species? (Nov-Dec 2017)

These species which are found only in a particular region are known as endemic species.

Eg. Endemic flora species- *Sapria himalayana*, *Ovaria lurida*,
Endemic fauna species- Monitor lizards, reticulated python.

**UNIT-I
PART-B
ENVIRONMENT**

- 1. Discuss the structure of atmosphere.**
- 2. Explain the community participation in environment management programmes.**
- 3. What are the components of the environment? Explain their roles. (May - June 2016)**

ECOSYSTEM

Describe the types, characteristic features, structure and function of

- 4. Forest eco system (Nov-Dec 2013) (Nov-Dec 2015)**
- 5. Aquatic eco system ((April-May2015) (Nov-Dec 2015)**
- 6. Grass land ecosystem.(Nov-Dec 2014) (Nov/Dec 2015) (April-May 2017) (April-May2018)**
- 7. Describe the types, characteristic features, structure and function of**
 - i) Desert ecosystem (May-June 2013) (April-May2018)**
 - ii) Estuarine ecosystem.**
- 8. Explain energy flow in ecosystem, food chain and food web. (Nov-Dec 2013)**
- 9. Explain ecological pyramids and their types. (May/June 2014) (April-May2015) (Nov-Dec 2015).**
- 10. Discuss the structure and function of an ecosystem in detail. OR Discuss the components of ecosystem. (Nov/Dec 2014) (May - June 2016) (Nov-Dec 2016)**
- 11. Give the types and process of ecological succession. (May-June 2013) (April-May2015) (Nov-Dec 2015) (Nov-Dec 2016) (April-May2018)**
- 12. With a neat sketch discuss the nitrogen cycle. (Nov-Dec 2014)**
- 13. Explain briefly in energy flow through ecosystem. (Nov-Dec 2015)**
- 14. Explain oxygen and nitrogen cycle briefly with diagrams.(May-June 2016)**
- 15. Write short notes on following Food web&Food chain(May/June2014)(April-May2018)**

16. Write the importance of biological hazard in the environment. (April-May 2017)
17. Draw the process of food chain and food web. (April-May2018)

BIODIVERSITY

1. Explain the conservation of biodiversity. (Nov-Dec 2013 and 2014) (April-May 2017)
2. Write a note on measuring biodiversity.
3. Explain the role of biodiversity at global, national and local levels. (May-June 2014)
4. Explain in-situ and ex-situ conservation along with their merits and limitations. (May - June 2016) (Nov-Dec 2016) (April-May2018)
5. Describe the term hotspot in biodiversity. (Nov-Dec 2014) (Nov-Dec 2017)
6. Discuss endangered and endemic species of India.
7. Discuss the status of India as a mega diverse nation of bio diversity. (May-June 2013) (Nov-Dec 2016) (April-May 2017)
8. Describe the structural features of ecosystem.
9. Discuss the importance of biodiversity. (Nov-Dec 2013)
10. Explain the values of biodiversity. (May-June 2013) (Nov-Dec 2014) (April-May2018)
11. Identify and explain the major threats to the biodiversity of India. (Nov-Dec 2013) (April-May2015) (Nov-Dec 2015)(May - June 2016) (Nov-Dec 2017)
12. Discuss uniqueness of different ecosystems; Forest ecosystem, Grassland ecosystem, Desert ecosystem and aquatic ecosystem. (Nov-Dec 2017)
13. Discuss human animal conflicts with special reference to media coverage/ten control measures for man-wild life conflict. (Nov-Dec 2017) (April-May2018)

UNIT - II ENVIRONMENTAL POLLUTION
PART-A

1. Define pollution.

Pollution may be defined as the excessive discharge of undesirable substances into the natural quality of the environment and causing damage to humans, plants and animals.

2. What are suspended particulate matters? Give examples. (April-May 2018)

Suspended Particulate matters are the substances which cause undesirable effects on man and his environment. eg. Smoke, dust, soot, fumes, aerosols, liquid droplets, pollen grains etc.

3. What is photochemical smog?

- It is a mixture of brownish smoke and fog that frequently forms on clear, sunny days over large cities with significant amount of automobile traffic.
- It is mainly due to chemical reactions among nitrogen oxides and hydrocarbon by sunlight.

4. How will you control Air pollution?

- Air pollution can be minimized by
- Using low sulphur coal in Industries.
 - Removing NO_x during the combustion process.
 - Using mass transport system, bicycles.etc.
 - Planting more trees etc.,

5. Define Acid rain. Write its type. (Nov-Dec 2013) (April-May 2015)

Excess amount of acid present in the rain is called acid rain. It has two types,

Wet deposition: It involves acid rain or snow or dew

Dry deposition: It is the particles such as polluting gases, dust particles and gaseous elements are just absorbed by the surface of the earth or the plant bodies.

6. What is PAN? Give its detrimental effects. (May - June 2016)

Definition: PAN is Peroxy Acetyl Nitrates formed by the photochemical reaction between hydrocarbons, nitrogen oxides and light.

Effects: Damages plants and art, React explosively and produce chemical smog.

7. Define BOD and COD (Nov-Dec 2013)

BOD-Biological Oxygen Demand is the quantity of dissolved oxygen required by bacteria for the oxidation of organic matter under aerobic conditions.

COD- Chemical Oxygen Demand is the measure of both biologically oxidisable & inert organic materials present in the sewage.

8. What are point sources and non-point sources of pollution?

Point sources- Point sources are discrete discharges from pipes and other conduits such as sewage treatment plants and Industrial facilities.

Non-Point sources- It is broad, unconfined area from which pollutants enter a body of water. eg., urban storm water run-off, run-off from farm fields, acid rain etc.,

9. Give the source of radioactivity.

Natural sources- Cosmic ray from outer space, radioactive radon-222, soil, rocks, air, water and food which contains one or more radioactive substances.

Anthropogenic sources- Nuclear power plants, nuclear accidents, X-rays diagnostic kits, test laboratories etc.

10. What are the important physical and chemical parameters affecting the quality of water? (OR) Mention the water quality parameters. (Nov-Dec 2016)

Physical parameters: Colour, Taste and odour, Turbidity and sediments.

Chemical parameter: P^H, Acidity, Alkalinity, Fluoride, Nitrogen Nitrates, Sulphates, Chloride.

11. What is the role of Citizen in reducing pollution?

Help more in pollution prevention than control.

Use ecofriendly products.

Cut down the use of CFC's.

Adopt and popularize renewable energy resources.

12. What is meant by air pollution?

Air pollution may be defined as the presence of impurities in excessive quantity and duration to cause adverse effects on plants, animals, human beings and materials.

13. List the types of air pollutants.

Particulate pollutants- Dust, Smoke, Fly ash, Smog, etc.

Gaseous pollutants - SO₂, SO₃, CO₂, CO, H₂S, aerosols, etc.

Internal Combustion Engines - CO₂, CO, SO₂, NO₂ and hydrocarbons

14. Define thermal pollution

Addition of excess of undesirable heat to water that makes it harmful to aquatic life and cause significant changes of normal activities of aquatic communities.

15. Write any four major water pollutants.

Infectious agents, Organic wastes, In-organic wastes and Demand of O₂

16. Name the sources of soil pollution. (May/June - 2013)

Biotic agents, Industrial waste, Urban wastes, Domestic wastes, Radioactive wastes and Agricultural wastes.

17. Write briefly how human activities can introduce thermal pollution in Streams.

The addition of heat to water that changes the physical, chemical and biological characteristics of water and also harmful to man, animal and aquatic life. The atomic and Thermal power plants may utilize water for cooling the reactor and resultant warmed water is often discharged into streams or lakes that cause thermal pollution.

18. What are the sources of thermal pollution? (May - June 2016)

Nuclear power plants, Thermal power plants, Hydro electric power plants, Industrial effluents, Domestic sewage, Hydro electric power

19. What is marine pollution? Mention few reasons / sources for marine pollution.(Nov-Dec2014) (April-May 2017) (April-May2018)

Dumping of waste and oil spillage in the ocean cause threat to marine system is called marine pollution. Dumping of wastes and Oil Spilling.

20. What is noise pollution? How it is caused? (or) Define the term noise pollution.(Nov/Dec 2013) (April-May2015) (Nov-Dec 2015)(April-May2018)

It is an unwanted sound created by human activities is called noise pollution. Blaring loudspeaker, bursting of crackers, road traffic, aircraft taking off, massive industries and from entertainment centers.

21. What is disposal?

Disposal is the discharge, deposit, injection, dumping, spilling, leaking or placing of waste into or any land, water or air.

22. Differentiate between recycling and reuse.

S.No.	Recycling	Reuse
1.	Reprocessing of the discarded materials into new useful products	Usage of discarded materials
2.	Eg. Preparation of cellulose insulation from paper Aluminium cans and glass bottles are melted and recast into new cans and bottles	Discarded refillable containers can be reused Discarded cycle tubes can be reused to manufacture rubber rings.

23. What is composting?

The decomposition and stabilization of solid wastes taken place by biochemical bacteriological process under the controlled conditions is called composting. It occurs in 2 ways.

Aerobic decomposition

Anaerobic decomposition

24. What are the sources of Urban and Industrial waste?

Urban waste consists of medical waste from hospitals, municipal solid wastes from homes, offices, markets, small cottage units and horticulture wastes from park, garden, orchards etc.,

Industrial waste consist of a large no: of materials including factory rubbish, packaging materials organic wastes, acids, alkalis, metals etc.,

25. When is a waste said to be hazardous?

A waste is said to be *hazardous* if it possess one or more of the following characteristics,
Toxicity b)Reactivity c)Ignitability d)Radioactivity

26. What are the general methods to removal of heavy metals by adsorption?

Using coconut shell carbons

Using fly ash

Using clay and coal based adsorbents.

27. What are the causes and effects of ozone layer depletion?

Causes: Chloro fluoro carbon and Hydro Chloro fluoro carbon

Effects: Increases the average temperature of the earth. It also affects the aquatic forms.

28. What are the major causes of earthquake? (May/June 2014)

Underground nuclear testing.

Volcanic eruptions

Pressure of manmade dams, reservoir and lakes

Movement of plates of earth.

29. Mention the effects of ozone on plants. (Nov-Dec 2014)

Ozone effects on plants are most pronounced when soil moisture and nutrients are adequate and ozone concentrations are high. Under good soil moisture and nutrient conditions the ozone will enter through openings into the leaf and damage the cells that produce the food for the plants.

30. Define hazardous waste (Nov-Dec 2014)

Radio active and toxic wastes which poses substantial or potential threats or illness to human health and the environment is called as hazardous waste.

31. Define green house effect. (Nov-Dec 2014)

The progressive warming up of earth surface due to blanketing effect of manmade CO₂ in the atmosphere.

32. Differentiate between sound and noise. (Nov-Dec 2014)

S.No	Sound	Noise
1	Below 120 dB	Above 120 dB
2	It doesn't make pollution	It makes pollution

33. How does ozone layer depletion take place? (Nov-Dec 2014)

It occurs due to the presence of CO₂, CFC in the atmosphere.

34. What is the role of individual in preventing pollution? (Nov-Dec 2015)

- Plant more trees.
- Use water, energy and other resources efficiently.
- Reduce deforestation.
- Use CFC free refrigerators.

35. Mention the measures to control thermal pollution caused by industry. (Nov-Dec 2016)

- Cooling towers (Wet cooling tower & Dry cooling tower)
- Cooling Ponds
- Cooling Sprays
- Artificial Lake

36. Mention the effects of nuclear wastes in humans. (April-May 2017)

- The waste released from chemical industries and from explosives are dangerous to human life.
- The dumped waste degrade soil and make unfit for irrigation.

37. What are mitigation procedures? Give example. (April-May 2018)

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective we need to take action now—before the next disaster—to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk). It is important to know that disasters can happen at any time and any place and if we are not prepared, consequences can be fatal.

Example:

- Disasters (e.g. Cyclone and earthquake) can happen at anytime and anyplace; their human and financial consequences are hard to predict.
- The number of disasters each year is increasing but only 50% of events trigger Federal assistance.

38 List the types of nuclear reactors. (April-May 2018)

- ❖ Thermal Reactors and
- ❖ Fast neutron reactor

UNIT-II

PART-B

- 1. Write brief notes on solid waste management. State the measures recommended for proper management of the solid wastes.(Nov-Dec 2013) (May/June 2014) (April-May2015) (Nov-Dec 2016)**
- 2. Explain the causes, effects and control measure of water pollution.(Nov-Dec 2013) (May/June 2013) (May-June 2014) (Nov/Dec 2014) (Nov-Dec 2015) (May - June 2016) (April-May 2018)**
- 3. Explain the causes, effects and various methods of controlling air pollution. (May - June 2016) (May-June 2013) (Nov/Dec 2014) (April-May2015) (Nov-Dec 2015)**
- 4. Explain the concept of source, path receiver in the control of noise pollution. (Nov-Dec 2014) (Nov-Dec 2016) (April-May 2017)**
- 5. Explain the causes, effects and control measures of marine pollution. (Nov/Dec 2014) (Nov-Dec 2015) (May - June 2016) (Nov-Dec 2016) (April-May2018)**
- 6. Explain the causes, effects and control measures of nuclear hazards and explain any two case studies on nuclear pollution. (April-May2015) (Nov-Dec 2015) (April-May2018)**
- 7. Discuss the major soil pollution and their impact.**
- 8. Explain the disaster management in detail.**
- 9. Discuss the role of individual in preventing pollution. (Nov-Dec 2014) (April-May2015) (April-May2018)**
- 10. Explain the causes, effects and control measures of thermal pollution.(Nov-Dec 2013) (May/June 2014) (May-June 2013) (Nov-Dec 2015)**
- 11. Describe the various chemical and photochemical reactions in the atmosphere. (Nov-Dec2014) (May - June 2016) (April-May 2017)**
- 12. Write informative notes on water treatment processes. (Nov-Dec 2014) (April-May2018)**
- 13. Discuss the significance of any six parameters of drinking water quality standards. (Nov/Dec 2014)**
- 14. Discuss about the causes, impacts and control measures of ozone depletion in the atmosphere. (Nov-Dec 2016) (April-May2018)**
- 15. What are the effects of heavy metals in aquatic environment? (April-May 2017)**
- 16. What is a particulate matter? How is it controlled by using equipment? (April-May 2017)**
- 17. Discuss physical, chemical, biological parameters to ensure drinking water quality.(Nov-Dec 2017)**
- 18. Demonstrate the various classes of water pollution and enumerate in detail about the following i) Domestic waste water ii) Industrial waste and iii) storm water (April-May 2018)**
- 19. Illustrate in detail about Green house effect and Global warming with neat sketch(April-May 2018)**

UNIT-III NATURAL RESOURCES
PART-A

1. What are renewable and non-renewable energy resources? Give examples.

Renewable energy resources are natural resources which can be regenerated continuously and are inexhaustible. They can be used again and again in an endless manner.

2. State the environmental effects of extracting and using mineral resources. (May - June 2016)

Devegetation and defacing of landscape	Air pollution
Ground water contamination	Subsidence of land
Surface water pollution	

3. Define sustainable forestry.

It is the optimum use of forest resources which meet the needs of the present without compromising the ability of future generations to meet their own needs.

4. Define overgrazing.

Overgrazing is a process of eating away the forest vegetation without giving it a chance to regenerate.

5. What is desertification? Give two reasons for it.

It is a progressive destruction or degradation of arid or semi arid lands to desert.

Reasons:

Deforestation, Overgrazing, Mining and quarrying

6. What is water logging? Mention about the problems in water logging.

Water logging is the land where water stand for the most of the year.

Problems: During water logged conditions, pore-voids in the soil get filled with water and the soil-Air gets depleted. In such condition the roots of the plants do not get adequate for respiration. So, mechanical strength of the soil decreases and the crop yield fails.

7. What do you mean by environmental impact? (Nov-Dec 2014)

Environmental impact is nothing but the effect on the natural environment caused by various human actions.

8. Define soil leaching. List the effects of soil leaching.

The process in which materials in or on the soil gradually dissolve and are carried by water seeping through the soil.

Effects of soil leaching:

It removes valuable nutrients from the soil.

It may carry buried wastes into ground water and contaminates it.

9. Write any four functions of forests.

Forests perform very important functions both to humans and to nature.

They are habitats to millions of plants, animals and wildlife.

They recycle rain water and remove pollutants from air.

They control water quality and quantity

10. What are the causes of deforestation?

Developmental projects, Mining operations, Raw materials for industries, Fuel Requirements
Shifting cultivation and Forest fires.

11. Compare merits and problems of dams.

Merits of dams:

- Dams are built to control flood and store flood water
- Its used for diverting part or all of the water from river into a channel
- Dams are used mainly for drinking and agricultural purposes
- Dams are built for generating electricity

Problems of dams:

- Displacement of tribal people
- Loss of non-forest land
- Loss of forests, flora and fauna
- Water logging and salinity due to over irrigation
- Reduced water flow and silt deposition in rivers
- Salt water intrusion at river mouth

12. What is meant by soil erosion?

Soil erosion is the process of removal of superficial layer of the soil from one place to another. Soil erosion also removes the soil components and surface litter.

13. Differentiate deforestation with forest degradation.

Forest degradation	Deforestation
It is the process of deterioration of forest materials.	It is the process of destruction of forest materials.
Slow process	Rapid process
Can be recovered	Cannot be recovered

14. Enumerate the desired qualities of an ideal pesticide.

It must kill only the target species

It must be a biodegradable

It should not produce any new pests

It should not produce any toxic pesticide vapour

Excessive synthetic pesticide should not be used

Chlorinated pesticides and organophosphate pesticides are hazardous, so they should not be used.

15. Write any two adverse effects caused by overgrazing.

Land degradation, soil erosion and loss of useful species.

16. Differentiate renewable and non-renewable energy resources.

S.No.	Renewable energy	Non-renewable energy
1	It is regenerated continuously	Cannot be regenerated
2	Inexhaustible	exhausted
3	It can be used again and again	Cannot be used again
4	It is pollution-free	Pollutes the atmosphere
5	It is developed in a long period	It is developed in a short period

17. Mention the various causes of desertification.

Deforestation, overgrazing, water management, mining and quarrying, climate change and pollution.

18. What are the effects of dams on tribal people?

Due to continuous removal of minerals, forest covers, the trenches are formed on the ground leading to the water logged area, which in turn contaminates the ground water.

During mining operations, the vibrations are developed, which leads to earthquake.

When materials are disturbed in significant quantities during mining process, large quantities of sediments are transported by water erosion.

19. What is eutrophication?

A large proportion of N and P fertilizers used in crop fields is washed off by the runoff water and reaches the water bodies causing over nourishment of the lakes. The process of accumulation of nutrients in the water bodies is called eutrophication.

20. What do you mean by land degradation? What are the reasons for land degradation? (Nov-Dec 2015) (May - June 2016)

Definition: It is the process of deterioration / destroys soil or loss of fertility of the soil.

Causes: Population, Urbanization, Fertilizers and pesticides, Damage of top soil, Soil erosion, Water logging and Salination.

21. Wood is renewable resource but not coal. Why?

Wood is renewable resources because we can get new wood by growing a sapling into a tree within 15-20 years. But the formation of coal from trees has taken million of years and can not be regenerated in our life time.

22. Define the term sustainable development.

It is defined as all the natural resources must be used in such a way that it must be available for the future generation also.

23. Mention the major environmental impacts of mining. (Nov-2013)

Mining reduces the shape and size of forest areas.

It produces noise pollution.

It develops the vibration and hence earthquake will occur.

Water surface will pollute due to discharge of wastages.

24. What are the changes caused by overgrazing? (Nov-2013)

Land degradation

Soil erosion

Loss of useful species

25. State the use of bio-energy as a non-conventional source of energy.

The cost of obtaining bio-energy through bio-gas plant is less than the cost of obtaining energy from fossil fuels.

Bio-mass consumers more CO₂ than is released during combustion of bio-mass.

It provides a stored form of energy and in many cases in a form suitable for vehicle propulsion.

26. What is environmental biochemistry?

It involves approaches to treat polluted air, waste water and solid waste using metabolic activities of micro-organisms.

27. What are xenobiotics?

Biochemistry, used in environmental science to understand the effects of environment on living organisms as they interact with environmental pollutants.

28. What is energy conversion?

It is a process of changing energy from one form to another form.

29. What is ECO-mark?

Environmentally friendly products are generally indicated by the symbol called ECO-mark. It is a certification mark issued by the Bureau of Indian Standard (BIS) to environmental friendly products.

30. What is environmental ethics? (Nov/Dec-2013)

It refers to the issues, principles and guidelines relating to human interactions with their environment.

31. What is bio-gas? Mention its uses. (Nov-Dec 2016)

It is a mixture of various gases formed by an aerobic degradation of biological matter in the absence of free oxygen.

Composition of biogas:

Compound	%
Methane	50-75
CO ₂	25-50
N ₂	0-10
H ₂	0-1
H ₂ S	0-3
O ₂	0

Uses:

- It is used for cooking, heating water.
- It is used to run engines.
- It is used for running tube well and water pump set engine.
- It is used as an illuminant in villages.

32. State the reasons of over exploitations of forest. (May-June 2013)

Increasing agricultural production
 Increasing industrial activities
 Increase in demand of food resource

33. Write the ways of drought management. (May-June 2013)

Modern irrigation technology (drip irrigation) is very much useful to conserve water
 Rain water harvesting programme is another fruitful method to conserve more water and to control drought.

34. Write the economic importance of forests. (Nov/Dec-2013)

Commercial uses (fuel, pulp, paper, gums, dyes, medicines, drugs, mining)
 Ecological uses (production of O₂, reducing global warming)
 Aesthetic value
 Touristic value (ecotourism)

35. Write the problems due to constructions. (May/June-2014)

Deforestation, Pollution, Soil erosion, Devegetation.

36. Define non-renewable energy resources. (May/June-2014) (April-May2015) (Nov-Dec 2015)

Non renewable energy resources are natural resources which cannot be regenerated once and are exhaustible. They cannot be used again and again in an endless manner.

37. Define the term nuclear energy. (Nov-Dec 2014)

Energy release from nuclear fission reaction is known as nuclear energy.

38. Define renewable energy resources. (Nov-Dec 2014) (April-May2015) (Nov-Dec 2015)

Renewable energy resources are natural resources which can be regenerated. They can be used again and again in an endless manner.

39. Write the preventive methods of deforestation. (Nov-Dec 2014)

Planting more trees, Use of wood for fuel should be discouraged.

40. What is desertification? (April-May2015)

The progressive destruction of arid or semiarid lands to desert is known as desertification.

41. Write any two problems caused by high saline soils? (April-May 2017)

➤ Due to high saline soils, the soil becomes alkaline and crop yield decreases.

42. List some ways to protect soil. (April-May2018)

- ❖ Practice No-Till farming
- ❖ Use Terrace Farming
- ❖ Practice Contour Farming
- ❖ Plant Windbreaks

43. What is bioconversion of pollutants? Give example. (April-May2018)

Bioconversion is the change of pollutants into a source of energy by the action of micro organisms. It is the cheap and safe method.

e.g: Bioconversion of biomass into ethanol and methanol

UNIT-III

PART-B

1. Discuss the consequences of overdrawing surface and ground water. (Nov-Dec 2013) (Nov-Dec 2016)
2. Explain how the alternate energy sources play an important role in environmental impact.
3. Explain the environmental impacts of Mineral extraction/mining and use. (May/June-2013) (April-May2015) (Nov-Dec 2015) (April-May2018)/ Exploitation of Mineral resources with two case studies. (April-May2018)
4. Explain renewable and non-renewable energy resources with examples. Explain the merits and demerits of any two renewable energy resources. Why are non renewable energy resources preferred for energy utilization now-days? (May-2014) (Nov-Dec 2013) (May - June 2016)
5. Explain the major causes and ill effects of deforestation. (Nov-Dec 2013) (Nov-Dec 2014) (April-May2015) (Nov-Dec 2015) (Nov-Dec 2016) (April-May 2017) (April-May2018)
6. Explain briefly the various methods of harvesting solar energy.
7. Discuss the merits and demerits of wind energy and tidal power. (May/June-2013)
8. Describe the benefits and problems of constructing dams. (Nov/Dec-2013) (Nov-Dec 2015)
9. Explain the environmental impacts of modern agriculture (May-June 2013, 2014) (Nov/Dec 2014) (Nov-Dec 2015) (May - June 2016) (Nov-Dec 2016) (April-May 2017)(Nov-Dec 2017)
10. Explain any two conflicts over water confining to our nation.
11. Discuss in detail the causes and consequences of over exploitation of forest resources.
12. What are the ecological benefits of forests?
13. Discuss the effects of dams on forest and tribal people.
14. Discuss the timber extraction on forest and tribal people. (Nov/Dec-2013)
15. Discuss the role of individual in conservation of natural resources. (Nov/Dec-2013) (April-May2018)
16. Explain the hydrological cycle with its components with suitable sketch. (May/June-2014) (Nov/Dec 2014)
17. Explain the production and uses of biogas with neat diagram. (Nov-Dec 2014) (April-May 2015) (May - June 2016) (April-May 2017) (OR) Energy conversion process with suitable example. (April-May2018)
18. Explain bioconversion of pollutants with examples. (May - June 2016)
19. Explain in detail about biochemical degradation of pollutants. (April-May2018)
20. Write short notes on different types of energy sources. (May/June 2014)
21. Discuss the following (i) Land resources (ii) land degradation (iii) soil erosion and (iv) desertification (Nov/Dec-2013) (May/June-2013)(Nov-Dec 2014) (Nov-Dec 2016)
22. What are the changes caused by agriculture and overgrazing? (Nov-Dec 2014) (April-May2018)
23. Write note on i). Food resources ii). Mineral resources. (April-May 2015) (April-May2018)
24. Discuss the renewable sources of energy with respect to solar, wind and tidal power.(Nov-Dec 2017)

UNIT-IV SOCIAL ISSUES AND THE ENVIRONMENT

PART-A

1. Define sustainable development. (OR) Explain the term sustainability. (OR) Define sustainable life style. (Nov-Dec 2013) (May - June 2016) (Nov-Dec 2016)

Sustainable development can be summarized as 'meeting the needs of the present without compromising the ability of future generations to meet their own needs'.

2. Explain the concept of sustainable development.

The concept of sustainable development has the following underlying promises.

A symbiotic relationship between the consumer human race and the producer natural system.

Compatibility between ecology and economics.

3. What is the aim of national committee of environmental planning and co-ordination?

Conservation of natural resources.

Control of environmental pollution.

Environmental education.

Environmental laws.

4. Write down the components of Environmental Law.

Environmental Law includes official rules, decisions and actions concerning environmental quality, natural resources and ecological sustainability.

5. What are the major constitutional provisions in India for environmental protection?

Article 47

Article 48-A

Article 51-A (g)

Article 253.

6. State the Article-47 of the Indian Constitution.

Article 47 of the Constitution states that, "The State is to ensure as its primary duty of,

Raising standard of living of its people,

To increase the level of nutrition of the people,

To bring improvement in public health".

7. State the Article 48-A of the Indian Constitution.

Article 48-A of the Constitution states that, "the State shall endeavor for protection and improvement of the environment and for safeguarding the forest and wild life and improving the natural environment of the country".

8. State the Article 51-A (g) of the Indian Constitution.

According to Article 51-A (g) of the Constitution, it shall be the duty of every citizen of India 'to protect and improve the natural environment including forests, lakes, rivers, and wild life and to have compassion for living creatures'.

9. State the Article 253 of the Indian Constitution.

Article 253 of the Constitution empowers the parliament to make laws regarding preserving the environment. It states "The parliament has power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement or convention with any other country or countries or any decision made at any international conference, association or other body'.

10. List the major environmental conventions of 20th century.

World summit on sustainable development, The Earth Summit, World conference on women.

11. Name some of the acts enacted by the Indian Government to protect the environment.

The Water (prevention and control of pollution) Act 1974,1978

The Water (prevention and control of pollution) amended Act, 1987

The Air (prevention and control of pollution) Act 1981 amended in 1987.

The Environment (protection) Act 1972

The Public Liability Insurance Act 1991.

12. What are the common objectives of environmental legislation?

All the Acts were enacted to achieve the following:

To control further damage to the environment and ecosystem

To conserve the environment

To create authorities to administer the policy and contents of the legislation.

To provide penalties and prosecution for violation of laws.

13. List the major environmental protocols of 20th century.

Kyoto protocol

Montreal protocol.

14. Write notes on NGOs.

The groups working for social changes are called Non-Governmental Organizations (NGOs). When the activities are concerned with environmental issues they are called environmental NGOs.

15. Write notes on ‘Green Peace’:

‘Green peace’ is one of the largest NGOs in the world with 1.6 million contributing members, carries out well-published confrontations with toxic waste dumpers, seal hunters and others who threaten very specific and visible resources.

16. List some of the NGOs available in India.

World Wide Fund for Nature India.

Indian Environmental Association, Mumbai.

Environmental Society of India (ESI), Chandigarh.

Sastrakalayatha, Kerala.

C. P. Ramaswami Ayer Environmental Education Centre.

17. How does the community participation involve in protecting the environment?

Community participation requires involvement in several areas:

Better theoretical knowledge about the environmental information (both Scientific and traditional)

Better practical guidelines and tools are need.

Better educational support.

18. Write a short note on the history of implementation of international treaties and conventions.

- Intercontinental shipping of hazardous waste
- Reforestation
- Over-fishing

Trade in endangered species

19. Write down the purpose / objectives of The Water (Prevention and Control of Pollution)

Act, 1974. (Nov-Dec 2014)

The purpose of The Water Act is “to provide for the prevention and control of water pollution and the maintenance or restoring wholesomeness of water for the establishment, with a view to and carrying out the purpose of aforesaid of Boards for the prevention and control of water pollution, for conferring on and assigning to such Boards powers and functions relating thereto and for matters connected therewith”.

20. Write notes on Manufacture, Storage and Import of Hazardous chemical Rules, 1989.

These rules are applicable to three different types of flammable substances and about 450 hazardous chemicals. The importers of hazardous chemicals should inform the Board authorities of the following given details within 30 days, The place of entry in India, The name of address of the importer, Mode of transport and The quality of the chemicals and the safety details of the product.

21. What is meant by rain water harvesting? (Nov-Dec 2014)

Rain water harvesting is a technique of capturing and storing of rain water for further utilization.

22. What is environmental ethics? (Nov/Dec-2013) (April-May2018)

It refers to issues, principles and guidelines related to human interactions with their environment. (or) Ethics is a branch of philosophy. It deals with morals and values. An ethic is a principle for value that we use to decide whether an action is good or bad.

23. List the objectives of forest conservation act. (Nov/Dec-2013)

Protect and conserve the forest.

To ensure judicious use of forest products.

24. What is cyclone? (Nov/Dec 2013) (April-May 2017)

Cyclone is meteorological phenomena, intense depressions forming over the open oceans and moving towards the land.

25. What are biomedical wastes? Give example. (April-May2018)

Biomedical wastes are one type of bio-wastes generated from health care activities (hospitals, nursing homes, laboratories, etc.). They may be solid or liquid in nature.

26. What are landslides? (Nov-Dec 2014)

The movement of earthy materials like coherent rock, mud, soil and debris from higher region to lower region due to gravitational pull is called landslides.

27. Define floods.

Whenever the magnitude of water flow exceeds the carrying capacity of the channel within its banks, the excess of water over flows on the surroundings causes floods.

28. What are the advantages of rain water harvesting? (Nov-Dec 2015)

To increase the ground water level.

To avoid the contamination of water.

29. Define consumerism. (April-May2015) (Nov-Dec 2015) (Nov-Dec 2016)

Consumption of resources by the people is known as consumerism.

30. What do you mean by disaster management? (April-May2015)

Disaster Management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters.

31. State any two biomedical waste handling rules. (May - June 2016)

"Act" means the Environment (Protection) Act, 1986 (29 of 1986)

Bio-Medical Waste (Management and Handling) Rules, 1998

32. Write any four principles of green chemistry. (Nov-Dec 2016)

- Prevention
- Atom Economy
- Less Hazardous Chemical Syntheses
- Designing Safer Chemicals

33. What is nuclear holocaust? (Nov-Dec 2017)

It means destruction of biodiversity by nuclear equipments and nuclear bombs. In a holocaust a large number of living beings are totally destroyed. Usually these kind of destructions are happened in a nuclear war.

34. Write on EIA? (Nov-Dec 2017)

EIA (Environmental Impact Assessment) is defined as a formal process of crediting the environmental consequences of any development projects. It is used to identify the environmental, social and economic impacts of the project prior to decision making.

35. What is a watershed? (Nov-Dec 2017) (April-May2018)

Watershed is defined as the land area from which water drains under the influence of gravity into a stream, lake, reservoir or other body of surface water.

36. Define the term the Man induced landslide. (April-May2018)

These are basically the human activities like construction of roads, buildings, dams, etc. These have strong bearing on the Man Induced Landslides

37. Write the various uses of sustainable development indicators. (April-May2018)

It was developed by the OECD (Organization for Economic Co-operation and *Development*) from earlier work by the Canadian government. Increasingly widely accepted and internationally adopted, it can be applied at a national level, at sectoral levels, at the levels of an industrial firm, or at the community level. Pressure indicators measure policy effectiveness more directly -- whether emissions increase or decrease, whether forest depletion waxes or wanes, and whether human exposure to hazardous conditions grows or shrinks. Pressure indicators are thus particularly useful in formulating policy targets and in evaluating policy performance. They can also be used prospectively to evaluate environmental impacts of socioeconomic scenarios or proposed policy measures.

38. What is green chemistry?

Green chemistry is the use of chemical products and processes that reduce or eliminate substances hazards to human health or the environment.

UNIT-IV
PART - B

1. What is meant by rain water harvesting? Name and discuss in brief the types of rainwater harvesting. (Nov-Dec 2013) (Nov-Dec 2014) (April-May 2015) (April-May 2018)
2. Explain forest conservation act. (May-June 2013) (Nov-Dec 2014) (April-May 2017) (April-May 2018)
3. Write the factors influence the unsustainable to sustainable development. (Or) Discuss the recent approaches to achieve sustainable development. (May-June 2013) (May - June 2016)
4. Discuss the phenomenon of global warming and the factors contributing to it (Nov-Dec 2013) (April-May 2018)

Write a note on watershed management. (Nov/Dec-2013)

5. Discuss briefly on The Environment protection act 1986 and The Air Act (Nov/Dec-2013) (Nov-Dec 2013) (May/June 2014) (April-May 2015) (Nov-Dec 2015) (Nov-Dec 2016) (April-May 2017) (Nov-Dec 2017)
6. Explain the important provision in the wild life protective act (Nov-Dec 2014) (April-May 2018), air protection act, water protection act (May/June 2014) (May - June 2016) and environment protection acts. (Apr-May 2015) (Nov-Dec 2015)
7. Discuss the issues involved in the enforcement of environmental legislation.
8. Explain the powers and functions of state pollution control board.
9. Discuss the energy requirement in detail for sustaining urban life.
10. Describe the measures to conserve water.
11. Write a note on waste land reclamation. (May-June-2013) (May-June 2014) (April-May 2015) (Nov-Dec 2015)
12. Write about resettlement and rehabilitation of people. (Nov-Dec 2014) (April-May 2018)
13. What are the major urban problems related to energy? (Nov/Dec-2013) (May-June 2013)
14. Write short notes on nuclear accidents and holocaust with case studies. (Nov/Dec-2013) (May-June 2013) (April-May 2015)
15. Explain the Water (prevention and control of pollution act) 1974. (May-2014) (Nov/Dec 2014)
16. Explain the following
 - Floods
 - Earthquake (Nov-Dec 2013) (May/June 2014) (Nov-Dec 2014) (Nov-Dec 2015)
 - Cyclone (Nov-Dec 2015) (Nov-Dec 2016)
 - Landslides (May-June 2013)
17. Explain the following (May-June 2013)
 - i). Consumerism
 - ii). Waste products
18. Explain in detail, how biomedical wastes are managed and handled? (Nov-Dec 2015) (Nov-Dec 2016)
19. What is green chemistry and what are its 12 principles?. (May - June 2016) (April-May 2017) (Nov-Dec 2017) (April-May 2018)
20. Discuss the various applications of green chemistry for achieving sustainable development. (May - June 2016)
21. What is ECO mark? Explain. (Nov-Dec 2016)
22. Explain the role of state and central pollution control board. (April-May 2018)
23. Discuss about the effects of nuclear hazards. (April-May 2018)

**UNIT-V HUMAN POPULATION AND THE ENVIRONMENT
PART-A**

1. List the problems of population growth./ Population explosion. (April-May2018)

- Increasing demands for food and natural resources.
- Inadequate housing and health services.
- Loss of agricultural lands.
- Unemployment and socio-political unrest.
- Environmental pollution.

2. Define doubling time. (Nov – Dec 2013)

Population explosion can be better understood by considering the doubling time. i.e., the number of years needed for a population to double in size.

$$T_d (\text{Doubling time}) = 70/r$$

Where, r = annual growth rate

If a nation has 2% annual growth, its population will double in next 35 years.

3. What is total fertility rate?

It is the average number of children delivered by a woman in her life time.

The TFR value varies from 2 in developed countries to 4.7 in developing countries.

4. Define population explosion. (Nov-Dec 2013) (April-May2015) (Nov-Dec 2015) (May - June 2016) (April- May2018)

The enormous increase in population, due to low death rate (mortality) and high birth rate (Natality) is termed as population explosion. The human population is not increasing at a uniform rate in all parts of the world.

5. Differentiate between HIV and AIDS

HIV	AIDS
Human Immuno deficiency Virus	Acquired Immune Deficiency Syndrome
It is a virus	It is a disease

6. What are the reasons behind the increased population growth in the less developed nations compared with developed nations?

The rapid population growth is due to decrease in death rate and increase in birth rate.

The availability of antibiotics, immunization, increased food production, clean water and air decreases the famine- related deaths and infant mortality. In agricultural based countries, children are required to help parents in the fields that is why population increases in the developing countries.

7. Define population equilibrium.

A state of balance between birth rate and death rate in a population is known as population equilibrium.

8. What are the major precautions to avoid AIDS?

- Avoid indiscriminate sex and encourage the use of condoms and also avoid the use of shaving razors, needles and syringes.
- Prevention of blood born HIV transmission.
- Aids awareness programmes should be encouraged.
- Counseling services should be provided.

9. What are the causes of population explosion? (Nov-Dec 2014)

Invention of modern medical facilities reduces the death rate (mortality) and increases the birth rate (Natality) which leads to population explosion.

Increase of life expectancy is another important reason for the population explosion.

10. What are the objectives / advantages of family welfare programme? (April-May 2015)

Slowing down the population explosion by reducing the fertility.

Pressure on the environment due to over exploitation of natural resources is reduced.

11. Define immigration and emigration.

Immigration: It denotes the arrival of individuals from neighboring population.

Emigration: It denotes the dispersal of individuals from the original population to new areas.

12. What are the factors which do not influence transmission of HIV?

Tears, food and air, cough, handshake, mosquito, flies, insect bites, urine, saliva during normal kissing, sharing of utensils, cloths, toilet, bathroom, etc.

13. How does HIV functions in human body?

White blood cells (WBC) responsible in the formation of antibodies are called T helper cells. T helper cells are the key infection fighters in the immune system. The HIV enter into the human body and destroys the T cells, as a result of which various types of infection diseases occur.

14. Define population equilibrium.

A state of balance between birth rate and death rate in a population is known as population equilibrium.

15. State the role of information technology in environment.

Information technology plays a vital role in the field of environmental education. Information technology means collection, processing storage and dissemination of information. A number of software has been developed to study about the environment.

16. Mention some ill effects of HIV/AIDS.

Large number of death occur which affect environment and natural resources.

Due to large number of deaths there is loss of labour and level of production decreases

More water is required for maintaining hygiene in AIDS affected locality.

The people affected by HIV cannot perform work well due to lack of energy.

17. What is meant by NIMBY syndrome?

NIMBY means Not In My Back Yard, which describes the opposition of residents to the nearby location of something they consider undesirable, even if it is clearly a benefit for many.

18. Define population density.

It is expressed as the number of individuals of the population per unit area (or) unit volume.

19. Define population equation.

$$P_{t+1} = P_t + (B-D) + (I-E)$$

Where, P_t and P_{t+1} = sizes of population in an area at two different points in time t and $t+1$

B = birth rate, D = death rate, I = immigration and E = emigration

20. Write the objectives/importance of value education. (Nov-Dec 2014)

To improve the integral growth of human beings.

To create attitudes and improvement towards sustainable lifestyle.

To increase awareness about our national history, our cultural heritage, constitutional rights,

To create and develop awareness about the values and their significance and role.

21. What are human rights?

Human rights are the fundamental rights, which are possessed by all human beings, irrespective of their caste, nationality, sex and language.

22. Name any two schemes of human health program initiated by Indian Government on effects of population growth.

- National Vector borne Disease Control Program
- National Iodine Deficiency Disorders Control Program
- National Cancer Control Program
- National Aids Control Program

23. What is meant by human demography?

The study of statistics on human populations including elements such as growth rate, age and sex ratios, distribution, density and their effects on socioeconomic and environmental conditions.

24. What are the reasons for declining Birth rate?

The non-availability of anti-biotic, immunization, decreased food production, cleans water and air.

25. Why is variation important within a population?

In order to improve the economic status of the people and decrease of population growth, the variation is important within a population. Generally the following variation must be present within a population.

- Pre-productive population (0-14 Years)
- Re-productive population (15-44 years)
- Post reproductive population (Above 45 years)

26. What are the various schemes of various organizations towards women welfare?

- The National Network for Women and Mining
- United Nations Decade for Women
- International Convention on the Elimination of All forms of Discrimination against women.
- NGO's as Mahila Mandals.
- Ministry for Women and Child development.

27. State the human right to food and environment.

All human beings have the right to get sufficient healthy food, safe drinking water and healthy environment.

28. Mention about the applications of remote sensing in forestry.

Sustainable forest management requires reliable information on the type, density and extent of forest cover, wood volume and biomass, forest fire, pest and disease induced losses, encroachment etc., remote sensing provides all such information clearly.

29. What is NEDS?

NEDS is National Emission Data System and is developed by the Environmental Protection Agency of USA. This NEDS works for coding, storage, retrieval and analysis of nationwide air emission data.

30. Give some Examples for Bell shaped variation of population.

- France, UK, USA, Canada, etc.,

31. What is meant by remote sensing? (May/June-2013)

It is used more commonly to denote identification of earth features by directing the characteristics electromagnetic radiation that is reflected/emitted by the earth.

32. What is value education? (Nov/Dec-2013) (May/June-2014) (April-May 2017)

It is an instrument used to analyze our behaviour and provide proper direction to our youth. It teaches to youth the distinction between right and wrong, to be helpful loving, generous and tolerant.

33. Write the reason for child labour. (May/June-2014)

Poverty

Want of money

34. What are the objectives and benefits of environmental impact assessment (EIA)? (May/June-2014) (Nov-Dec 2016)

EIA is defined as a formal process of predicting the environmental consequences of any developmental projects.

Objectives of EIA

To identify who is the party

To identify why problems arise.

Benefits of EIA

To maintain the biodiversity.

To save money and time.

35. What are the sources of HIV infection? (Nov-Dec 2014)

HIV from infected person can pass to normal person through blood contact.

Using needles or syringes, contaminated with small quantities of blood from infected person.

36. State the role of information technology in environmental. (Nov-Dec 2015)

It means data collection, processing, reporting and dissemination of the environment.

37. Mention any two family welfare programs adopted in India. (May - June 2016)

National population policy

National health policy

38. What are the objectives of women welfare systems? (Nov-Dec 2016)

- To improve employment opportunities.
- To provide educations.
- To generate awareness about the environment.
- To restore dignity and status.

39. What is mitigation? (Nov-Dec 2017)

The implementation of measures designed to reduce the undesirable effects of a proposed action on the environment

40. What is child abuse? (Nov-Dec 2017)

Child abuse is when a parent or caregiver, whether through action or failing to act, causes injury, death, emotional harm or risk of serious harm to a child. There are many forms of child maltreatment, including neglect, physical abuse, sexual abuse, exploitation and emotional abuse.

41. Define GIS remote sensing. (April-May2018)

GIS applications enable the storage, management, and analysis of large quantities of spatially distributed data. These data are associated with their respective geographic features. For example, water quality data would be associated with a sampling site, represented by a point. Data on crop yields might be associated with fields or experimental plots, represented on a map by polygons.

42. Name some test available to find HIV infection. (April-May2018)

- ELISA test (**Enzyme-Linked Immuno Sorbent Assay**)
- Western blot test

UNIT-V
PART-B

- 1. Discuss briefly on the reasons and effects of the population explosion. (Nov/Dec 2013) (Nov-Dec 2015) (Nov-Dec 2016)**
- 2. What are the modes of transmission of HIV how it can be prevented? (Nov/, 2013) (April-May 2017) (Nov- Dec 2015) {OR} Write a note on AIDS in developing countries. (May-June 2013) (May/June-2014) (Nov-Dec 2013) (Apr-May 2015) (May - June 2016) (April-May 2017)/ How to give value education on HIV/AIDS?. Explain. (April-May2018)**
- 3. Explain in detail about Women welfare and child welfare. (Nov/Dec-2013) (May/June-2014) (Nov- Dec 2014) (Apr-May 2015) (Nov-Dec 2015) (May - June 2016) (April-May2018)**
- 4. Write a note on the various methods of family planning. (Nov/Dec 2013) (May/June-2014)/ What are the family welfare programmes available? Explain. (April-May2018)**
- 5. Define Human rights and discuss the salient features of the universal declaration of Human rights by UN? (Apr-May 2015) (Nov-Dec 2015)**
- 6. Write a short note on Value education.(May-June 2013) (Nov-Dec 2014) (Apr-May 2015) (Nov-Dec 2015) (Nov-Dec 2016)**
- 7. Discuss the influence of environmental parameters on human health. (OR) Discuss the factors influencing human health under current environmental conditions. (Nov-Dec 2016)**
- 8. Explain the role of information technology in environment protection and Ten role of IT in Human Health Protection. (Nov/Dec-2013 and 2014) (Apr-May 2015) (Nov-Dec 2016) (April-May 2017) (Nov-Dec 2017) (April-May2018)**
- 9. Write a neat diagram and explain the variation in population growth among various nations. (Or) What are sparsely populated areas? Give examples and reasons for poor population in those areas.(Nov- Dec 2013) (Nov-Dec 2014) (May - June 2016)**
- 10. Explain a note on EIA. (May - June 2016) (April-May 2017)**
- 11. Discuss the linkages among population explosion, development and environment. ((Nov-Dec 2017)**

PART-C

- 1. Explain about any two methods of biodegradation of pollutants. (Nov-Dec 2016)**
- 2. Mention a case study on Man – Wild life conflicts. (Nov-Dec 2016)**
- 3. Mention a case study on Productive use of biodiversity. (Nov-Dec 2016)**
- 4. Illustrate any two methods of harnessing alternative sources of energy. (Nov-Dec 2016)**
- 5. Describe in detail about any one pollution related case study. (Nov-Dec 2016)**
- 6. Enlist the rules of management and handling biomedical waste and analyse critically the problems associated with the implementation. (April-May 2017) (Nov-Dec 2017)**
- 7. Analysis the environmental effects of extracting and using mineral resources and write the remedies taken. (April-May 2017)**
- 8. India is a mega diversity nation. Explain in detail about this statement. Explain the in situ and ex situ conservation of biodiversity. (Nov-Dec 2017)**
- 9. Explain in detail and how will you calculate the rain water harvesting potential for your house? (April-May2018)**
- 10. Compare physical and chemical, characteristics of Marian water with terrestrial water. (April-May2018)**
- 11. Give a case study of any anthropogenic(Manmade) pollution disaster know to you and discuss the effect of these on environment(including the human population) in which they happen. (April-May2018)**

V.S.B. ENGINEERING COLLEGE, KARUR
Department of Electronics and Communication Engineering

Academic Year: 2018-2019 (ODD Semester)

Class: III Year / V Semester & ECE 'A' Section

Name of Subject: EC 6504- Microprocessor and Microcontroller

MICROPROCESSOR AND MICRO CONTROLLER

2 MARK QUESTION AND ANSWER

UNIT I – THE 8086 MICROPROCESSOR

1. What is the data and address size in 8086?

The 8086 can operate on either 8-bit or 16-bit data. The 8086 uses 20 bit address to access memory and 16-bit address to access I/O devices.

2. Write the flags of 8086?

The 8086 has nine flags and they are

1. Carry Flag (CF) 6. Overflow Flag (OF)
2. Parity Flag (PF) 7. Trace Flag (TF)
3. Auxiliary carry Flag (AF) 8. Interrupt Flag (IF)
4. Zero Flag (ZF) 9. Direction Flag (DF)
5. Sign Flag (SF)

3. What are the interrupts of 8086?

The interrupts of 8086 are INTR and NMI. The INTR is general maskable interrupt and NMI is non-maskable interrupt.

4. Write the special functions carried by the general purpose registers of 8086?

The special functions carried by the registers of 8086 are the following.

Register Special function

1. AX 16-bit Accumulator
2. AL 8-bit Accumulator
3. BX Base Register
4. CX Count Register
5. DX .Data Register

5. Define pipelining?

In 8086, to speedup the execution of program, the instructions fetching and execution of instructions are overlapped each other. This technique is known as pipelining. In pipelining, when the nth instruction is executed, the n+1th instruction is fetched and thus the processing speed is increased.

6. What are the functional units available in 8086 architecture?

The bus interface unit and execution unit are the two functional units available in 8086 architecture.

7. What is linker?

A linker is a program used to join together several object files into one large object file. For large programs it is more efficient to divide the large program modules into smaller modules. Each module is individually written, tested & debugged. When all the modules work they are linked together to form a large functioning program.

8. List the segment registers of 8086?

The segment registers of 8086 are Code segment, Data segment, Stack segment and Extra segment registers.

9. What is interrupt I/O?

If the I/O device initiates the data transfer through interrupt then the I/O is called interrupt driven I/O.

10. Explain ALIGN & ASSUME?

The ALIGN directive forces the assembler to align the next segment at an address divisible by specified divisor. The format is ALIGN number where number can be 2, 4, 8 or 16. Example ALIGN 8. The ASSUME directive assigns a logical segment to a physical segment at any given time. It tells the assembler what address will be in the segment registers at execution time. Example ASSUME CS: code, DS: data, SS: stack

11. Explain PTR & GROUP?

A program may contain several segments of the same type. The GROUP directive collects them under a single name so they can reside in a single segment, usually a data segment. The format is Name GROUP Seg-name,.....Seg-name
PTR is used to assign a specific type to a variable or a label. It is also used to override the declared type of a variable.

12. Explain about MODEL?

This directive provides short cuts in defining segments. It initializes memory model before defining any segment. The memory model can be SMALL, MEDIUM, COMPACT or LARGE.

Model	Code segments	Data segments
Small	One	One
Medium	Multiple	One
Compact	One	Multiple
Large	Multiple	Multiple

13. Explain PROC & ENDP?

PROC directive defines the procedures in the program. The procedure name must be unique. After PROC the term NEAR or FAR are used to specify the type of procedure. Example FACT PROC FAR. ENDP is used along with PROC and defines the end of the procedure.

14. Explain TITLE & TYPE?

The TITLE directive helps to control the format of a listing of an assembled program. It causes a title for the program to print on line 2 of each page of the program listing. Maximum 60 characters are allowed. Format TITLE text.

TYPE operator tells the assembler to determine the type of specified variable in bytes. For bytes the assembler gives a value 1, for word 2 & double word 4.

15. Define SOP?

The segment override prefix allows the programmer to deviate from the default segment

Eg : MOV CS : [BX] , AL

16. Explain SEGMENT & ENDS?

An assembly program in .EXE format consists of one or more segments. The starts of these segments are defined by SEGMENT and the end of the segment is indicated by ENDS directive. Format Name SEGMENT Name ENDS

17. Define variable?

A variable is an identifier that is associated with the first byte of data item. In assembly language statement: COUNT DB 20H, COUNT is the variable.

18. What are procedures?

Procedures are a group of instructions stored as a separate program in memory and it is called from the main program whenever required. The type of procedure depends on where the procedures are stored in memory. If it is in the same code segment as that of the main program then it is a near procedure otherwise it is a far procedure.

19. Explain the linking process?

A linker is a program used to join together several object files into one large object file. The linker produces a link file which contains the binary codes for all the combined modules. It also produces a link map which contains the address information about the link files. The linker does not assign absolute addresses but only relative address starting from zero, so the programs are relocatable & can be put anywhere in memory to be run.

20. Explain about passing parameters using registers with example?

Procedures process some data or address variable from the main program, for processing it is necessary to pass the address variables or data. This is called passing parameters to procedures. In passing parameters using registers the data to be passed is stored in registers & these registers are accessed in the procedure to process the data.

```
CODE SEGMENT
MOV AL, DATA
CALL PRO1
PRO1 PROC NEAR
MOV INPUT, AL
RET
PRO1 ENDP
CODE ENDS
```

21. What is recursive procedures?

A recursive procedure is a procedure, which calls itself. Recursive procedures are used to work with complex data structures called trees. If the procedure is called with N=3, then the N is decremented by 1 after each procedure CALL and the procedure is called until N=0.

22. What are libraries?

Library files are collection of procedures that can be used in other programs. These procedures are assembled and compiled into a library file by the LIB program. The library file is invoked when a program is linked with linker program. when a library file is linked only the required procedures are copied into the program. Use of library files increase s/w reusability & reduce s/w development time.

23. What are Macros?

Macro is a group of instruction. The macro assembler generates the code in the program each time where the macro is called. Macros are defined by MACRO & ENDM directives. Creating macro is similar to creating new opcodes that can be used in the program

```
INIT MACRO
MOV AX, data
MOV DS
MOV ES, AX
ENDM
```

24. How do 8086 interrupts occur?

An 8086 interrupt can come from any of the following three sources

- External signals
- Special instructions in the program
- Condition produced by instruction

25. What are the 8086 interrupt types?

Dedicated interrupts

- Type 0: Divide by zero interrupt
- Type 1: Single step interrupt
- Type 2: Non maskable interrupt
- Type 3: Breakpoint
- Type 4: Overflow interrupt
- Type 0-255 Software interrupts

26. What is interrupt service routine?

Interrupt means to break the sequence of operation. While the CPU is executing a program an interrupt breaks the normal sequence of execution of instructions & diverts its execution to some other program. This program to which the control is transferred is called the interrupt service routine.

27. Define BIOS?

The IBM PC has in its ROM a collection of routines, each of which performs some specific function such as reading a character from keyboard, writing character to CRT. This collection of routines is referred to as Basic Input Output System or BIOS.

28. Explain PUBLIC?

For large programs several small modules are linked together. In order that the modules link together correctly any variable name or label referred to in other modules must be declared public in the module where it is defined. The PUBLIC directive is used to tell the assembler that a specified name or label will be accessed from other modules.

Format PUBLIC Symbol.

29. Explain DUP?

The DUP directive can be used to initialize several locations & to assign values to these locations. Format Name Data_Type Num DUP (value)

Example TABLE DW 10 DUP (0). Reserves an array of 10 words of memory and initializes all 10 words with 0. array name is TABLE.

30. What is the purpose of segment registers in 8086?

There are 4 segment registers present in 8086. They are

1. Code Segment (CS) register
2. Data Segment (DS) register
3. Stack Segment (SS) register
4. Extra Segment (ES) register

The code segment register gives the address of the current code segment. ie. It will points out where the instructions, to be executed, are stored in the memory.

The data segment register points out where the operands are stored in the memory.

The stack segment registers points out the address of the current stack, which is used to store the temporary results.

If the amount of data used is more the Extra segment register points out where the large amount of data is stored in the memory.

31. Discuss the function of instruction queue in 8086?

In 8086, a 6-byte instruction queue is presented at the Bus Interface Unit (BIU). It is used to prefetch and store at the maximum of 6 bytes of instruction code from the memory. Due to this, overlapping instruction fetch with instruction execution increases the processing speed.

32. What is the maximum memory size that can be addressed by 8086?

In 8086, an memory location is addressed by 20 bit address and the address bus is 20 bit address and the address bus is 20 bits. So it can address up to one mega byte (2^{20}) of memory space.

33. List the various addressing modes present in 8086?

There are 12 addressing modes present in 8086. They are,

(a) Register and immediate addressing modes

Register addressing modes

Immediate addressing mode

(b) Memory addressing modes.

Direct addressing modes

Register indirect addressing modes

Based addressing modes

Indexed addressing modes

Based Indexed addressing modes

String addressing modes

(c) I/O addressing modes

Direct addressing mode

Indirect addressing mode

(d) Relative addressing mode

(e) Implied addressing mode

34. How single stepping can be done in 8086?

By setting the Trace Flag (TF) the 8086 goes to single-step mode. In this mode, after the execution of each instruction the 8086 generates an internal interrupt and by writing some interrupt service routine we can display the content of desired registers and memory locations. So it is useful for debugging the program.

35. What are the functions of bus interface unit (BIU) in 8086?

- (a) Fetch instructions from memory.
- (b) Fetch data from memory and I/O ports.
- (c) Write data to memory and I/O ports.
- (d) To communicate with outside world.
- (e) Provide external bus operations and bus control signals.

36. What is the clock frequency of 8086?

8086 8086-2 8086-4 Internal clock Frequency 5 MHz 8MHz 4MHz
External Clock Frequency 15MHZ 24MHZ 12MHZ

37. Explain REPEAT-UNTIL statements

REPEAT-UNTIL statements allow executing a series of instructions repeatedly until some condition occurs. The REPEAT defines the start of the loop & UNTIL the end of the loop. UNTIL has a condition when the condition is true the loop is terminated

38. Differentiate between absolute and linear select decoding?

Absolute decoding Linear decoding All higher address lines are defined to select the memory or I/O device Few higher address lines are decoded to select the memory or I/O device More h/w is required to design decoding logic Hardware required to design decoding logic is less Higher cost for decoding circuit Less cost for decoding circuit No multiple address Has a disadvantage of multiple addressing Used in large systems Used in small systems

39. What are the three classifications of 8086 interrupts?

- (1) Predefined interrupts
- (2) User defined Hardware interrupts
- (3) User defined software interrupts.

40. Explain the process control instructions

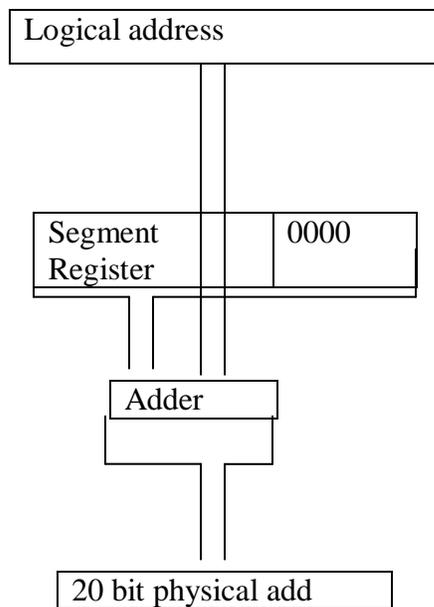
STC – It sets the carry flag & does not affect any other flag
CLC – it resets the carry flag to zero & does not affect any other flag
CMC – It complements the carry flag & does not affect any other flag
STD – It sets the direction flag to 1 so that SI and/or DI can be decremented automatically after execution of string instruction & does not affect other flags
CLD – It resets the direction flag to 0 so that SI and/or DI can be incremented automatically after execution of string instruction & does not affect other flags
STI – Sets the interrupt flag to 1. Enables INTR of 8086.
CLI – Resets the interrupt flag to 0. 8086 will not respond to INTR.

41. Mention the addressing modes of the following 8086 instructions

MOV AL,disp[BX]; MOV AH,disp[BX][SI]

MOV AL,disp[BX]= Register relative addressing mode
 MOV AH,disp[BX][SI] =Relative based indexed addressing mode.

42. What does it implies if the states of 8086 – BHE and A0 are at 0,1 respectively
 When $\overline{BHE} = 0$ and $A0 = 1$, 8086 can access even byte address (D0-D7)
43. What is the addressing modes of the following instructions JMP 3001h,MOV AH,55H [BX][SI]
 JMP 3001h inter segment indirect addressing mode
 MOV AH, 55H [BX][SI] Relative based indexed addressing mode
44. What is the storage space required to store the interrupt vectors of 8086?
 In 8086, 256 interrupt type's required (256X4) 1024 bytes storage space
45. List any four Unconditional branch instructions
 CALL, JMP, RET & LOOP
46. What is mean by software interrupt in 8086?
 The software interrupts are program instructions. These instructions are inserted at desired locations in a program. While running a program, if a software interrupt is encountered then the processor executes on interrupt service routine(ISR).
47. How the 20 bit effective address is calculated in an 8086 processor



$$\text{Effective address} = (\text{segment address} \times 10H) + \text{offset address}$$

48. What is the function of T & D flags in 8086
 D flag string direction flag; it is used set direction in string operation
 T flag single step trap flag; it is used for single stepping through a program.
49. What is the operation carried out when 8086 executes instruction MOVSW

MOVSW-move word string this instruction Transfers a word from the source string (addressed by SI) to the destination string (addressed by DI) and updates SI and DI to point to the next string element.

50. What is the role of IF flag in the flag register of 8086?

If (Interrupt flag) setting IF causes the 8086 to receive external maskable interrupts through INTR pin. Clearing IF disables these interrupts

51. Name the signals used by 8086 to demultiplex the address/data bus. _____

The signals used by 8086 to demultiplex the address/data bus are $\overline{\text{BHE}}$, A0 and ALE.

52. What is the purpose of pointer and index registers?

The purpose of pointer is to point the address and string is referred to as pointers. The length is 16 bit long and responsible for memory addressing.

The index registers are source index and destination index.

53. What is the use of assume directive?

Assume directive is useful in defining a section of a program or a data array.

54. Define ISR.

Interrupt service routine

Time is known as ISR. The starting address is referred as interrupt vector or 3 interrupt pointer. There are up to 256 interrupt vectors are available in the interrupt vector table.

55. Define an assembler?

It is a translator, to translate the ALP in to Machine language.

The execution time is less

56. Mention the flags of 8086.

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
X	X	X	X	OF	DF	IF	TF	S	Z	X	AC	X	P	X	C

57. What are the interrupts of 8086?

The interrupts of 8086 are INTR and NMI. The INTR is general mask able interrupt and NMI is non-mask able interrupt.

58. Mention the advantages of segmented memory organization.

Segmented memory structure is very much suitable for time-sharing computer system applications. Since, program code and data are stored in separate part of memory called segmented memory, switching from one task to another task by the system become easier.

It is sufficient to store only 16 bit quantities of segment: Offset address values with in the registers of the processor, instead of 20bit quantities.

59. Mention the difference between NEAR CALL and FAR CALL statements.

If near call is used in the program means, it specifies that the call instruction and the called subroutine lie in the same segment. Far call defines that CALL instruction and the called subroutine lie in the different two segments.

60. What is the use of interrupt vector table (IVT) in 8086 processors?

8086 processor supports up to 256 interrupts. The interrupt vector table is used to hold the starting addresses of these 256 interrupt service routines. Each ISR starting address occupies 4 memory locations within the interrupt vector table and the total size of this table will be 1 K bytes of memory.

61. Explain about DB, DW and DD directives.

DB, DW and DD directives are used to assign names for the values used with in the user program. DB is used for byte variables, DW and DD are used for word and double-word type of data's.

62. What is fetch and execute cycle?

In general, the instruction cycle of an instruction can be divided into fetch and execute cycles. The fetch cycle is executed to fetch the opcode from memory. The execute cycle is executed to decode the instruction and to perform the work instructed by the instruction.

63. Define opcode and operand.

Opcode (Operation code) is the part of an instruction / directive that identifies a specific operation. Operand is a part of an instruction / directive that represents a value on which the instruction acts.

Part-B Questions

1. Explain the internal hardware architecture of 8086 microprocessor with neat diagram?
2. Write short note about assembler directives?
3. Explain the various addressing modes of 8086 microprocessor with examples?
4. Explain Data transfer, arithmetic and branch instructions?
5. Write an 8086 ALP to find the sum of numbers in the array of 10 elements?
6. Explain modular programming in detail?
7. Write a note about stack, procedures and macros?
8. Define interrupt and their two classes? Write in detail about interrupt service routine?
9. Explain byte and string manipulation with examples?
10. Write in detail about instruction formats and instruction execution timing?
11. Write an ALP to find the largest number and smallest number in the array?
12. Write a short note about
 - (i) Loop, NOP and HLT instructions
 - (ii) Flag manipulation, logical and shift & rotate instructions?

UNIT II – THE 8086 SYSTEM BUS STRUCTURE

1. List the components of microprocessor (single board microcomputer)based system?

The microprocessor based system consist of microprocessor as CPU, semiconductor memories like EPROM and RAM, input device, output device and interfacing devices.

2. Explain the function of M/I/O in 8086?

The signal M/I/O is used to differentiate memory address and I/O address. When the processor is accessing memory locations M/I/O is asserted high and when it is accessing I/O mapped devices it is asserted low.

3. Why interfacing is needed for I/O devices?

Generally I/O devices are slow devices. Therefore the speed of I/O devices does not match with the speed of microprocessor. And so an interface is provided between system bus and I/O devices.

4. What is the difference between CPU bus and system bus?

The CPU bus has multiplexed lines but the system bus has separate lines for each signal. (The multiplexed CPU lines are demultiplexed by the CPU interface circuit to form system bus).

5. What does memory-mapping mean?

The memory mapping is the process of interfacing memories to microprocessor and allocating addresses to each memory locations.

6. What is the function of the signal in 8086?

BHE signal means Bus High Enable signal. The BHE signal is made low when there is some read or write operation is carried out, i.e. Whenever the data bus of the system is busy i.e. whenever there is some data transfer then the BHE signal is made low.

7. State modes in which 8086 operates

Maximum mode and minimum mode.

8. State the significance of LOCK signal in 8086?

If 8086 is working at maximum mode, there are multiple multiprocessors are present. If the system bus is given to a processor then the LOCK signal is made low. That means the system bus is busy and it cannot be given of any other processors. After the use of the system bus again the LOCK signal is made high. That means it is ready to give the system bus to any processor.

9. What is an interrupt driven I/O more efficient than programmed I/O for 8086 MP.

1) Interrupt I/O uses the built in interrupt capabilities

2) Interrupt I/O is asynchronous in nature

3) Programmed I/O is special I/O which is in full control data transfers. Using a software techniques called polling, the MP is synchronized to the speed of the PPI it is inefficient due to continuous states check

4) Processor response to the PPI only when ready and efficient because there is no need to poll the states

10. Give the function of the following 8086 CPU pins.

MN/MX – this pin configures CPU in minimum mode when strapped High and in maximum mode when strapped LOW.

LOCK- It locks the bus from being relinquished for DMA or other bus masters.

11. What is the function of TEST pin in 8086 processor?

TEST pin is used to check the software. If the TEST input is low, execution continues otherwise it waits until it goes to low.

12. Define Minimum mode operation.

This operation suited for single processor system. It offers 2Kx16EPROM and 1Kx16 static RAM. It also offers six 8-bit I/O ports.

13. Define Maximum mode operation.

This operation suited for multiprocessor system. 3 state signal used for the purpose of bus cycle status.

14. What is the purpose of latches?

Latches are used to store the address that is supplied to memory or I/O during the current machine cycle.

15. Advantages of minimum mode operation

Cheaper, Generate control signals, and I/O signals.

16. What is the advantages of 8086 processor?

Speed operation, Can solve complex problems

17. What are the basic multiprocessor configurations that the 8086 can support?

* Coprocessor configuration

* Closely coupled configuration

*Loosely configuration

18. What is multiprogramming?

If more than one process is carried out at the same time, then it is know as multiprogramming. Another definition is the interleaving of CPU and I/O operations among several programs is called multiprogramming. To improve the utilization of CPU and I/O devices, we are designing to process a set of independent programs concurrently by a single CPU. This technique is known as multiprogramming

19. What you mean by numeric processor?

8087 is the numeric or numeric co-processor. It adds arithmetic, trigonometric, exponential and logarithmic instructions to 8086 instruction set for all data types. It supports 16, 32, 64 bit integers, 32, 64, 80 bit floating point and 16 digit BCD data types.

20. Name the signals used by 8086 to control the data bus buffers.

In minimum mode of operation,

DT/R- data transmit/ receive

DEN – Data enable

In maximum mode of operation



s2	s1	s0	
0	0	0	INTA
0	0	1	I/O read
0	1	0	I/O write
0	1	1	Halt
1	0	0	Code access
1	0	1	Memory read
1	1	0	Memory write
1	1	1	passive

21. Name the three bus allocation schemes used in loosely coupled multiprocessor system.

- * Daisy chaining
- * Polling method
- * Independent Request

22. What are the advantages of a loosely coupled configuration in a multiprocessor system?

- * Each processor may have a local bus to access local memory or / I/O devices so that a greater degree of parallel processing can be achieved.
- * More flexible
- * Better system throughput by having more than one processor.
- * If any fault occurs in a module, that faulty module can be detected and replaced. So the breakdown of the entire system is avoidable.

Part-B Questions

1. Explain Minimum mode and maximum mode of operation in 8086 in detail.
2. Explain in detail about the system bus timing of 8086/8088.
3. Write notes on the following
 - (i) Programmed I/O
 - (ii) Interrupt I/O
4. Explain in detail about block transfers and DMA.
5. Explain in detail about closely coupled configurations.
6. Explain loosely coupled configurations in detail.
7. Explain the following in detail
 - (i) Process Management & iRMX86
 - (ii) Memory Management
 - (iii) Virtual Memory
8. Explain Numeric data Processor in detail.
9. Explain in detail about I/O Processor.
10. Explain the following
 - (i) Multiprocessor system
 - (ii) Coprocessor
 - (iii) Multiprogramming,
 - (iv) Semaphore

UNIT III – I/O INTERFACING

1. Write a short note on INTEL 8255?

The INTEL 8255 is a I/O port device consisting of 3 numbers of 8 –bit parallel I/O ports. The ports can be programmed to function either as a input port or as a output port in different operating modes. It requires 4 internal addresses and has one logic LOW chip select pin.

2. What is the drawback in memory mapped I/O?

When I/O devices are memory mapped, some of the addresses are allotted to I/O devices and so the full address space cannot be used for addressing memory (i.e., physical memory address space will be reduced). Hence memory mapping is useful only for small systems, where the memory requirement is less.

3. What is masking and why it is required?

Masking is preventing the interrupt from disturbing the current program execution. When the processor is performing an important job and if the process should not be interrupted then all the interrupts should be masked or disabled. In processor with multiple interrupts the lower priority interrupt can be masked so as to prevent it from interrupting, the execution of interrupt service routine of higher priority interrupt.

4. What is DMA?

The direct data transfer between I/O device and memory is called DMA.

5. What is the need for Port?

The I/O devices are generally slow devices and their timing characteristics do not match with processor timings. Hence the I/O devices are connected to system bus through the ports.

6. What is a port?

The port is a buffered I/O, which is used to hold the data transmitted from the microprocessor to I/O device or vice-versa.

8. How DMA is initiated?

When the I/O device needs a DMA transfer, it will send a DMA request signal to DMA controller. The DMA controller in turn sends a HOLD request to the processor. When the processor receives a HOLD request, it will drive its tri-stated pins to high impedance state at the end of current instruction execution and send an acknowledge signal to DMA controller. Now the DMA controller will perform DMA transfer

9. What is Block and Demand transfer mode DMA?

In Block transfer mode, the DMA controller will transfer a block of data and relieve the bus for processor. After sometime another block of data is transferred by DMA and so on. In Demand transfer mode the DMA controller will complete the entire Data transfer at a stretch and then relieve the bus to processor.

10. Why status signals are provided in microprocessor?

The status signals can be used by the system designer to track the internal operations of the processor. Also, it can be used for memory expansion (by providing separate memory banks for program & data and selecting the bank using status signals).

11. What is vectored and Non- Vectored interrupt?

When an interrupt is accepted, if the processor control branches to a specific address defined by the manufacturer then the interrupt is called vectored interrupt.

In Non-vectored interrupt there is no specific address for storing the interrupt service routine. Hence the interrupted device should give the address of the interrupt service routine.

12. What is the function performed by DI instruction?

The function of DI instruction is to enable the disabled interrupt system.

13. What is the function performed by EI instruction?

The EI instruction can be used to enable the interrupts after disabling.

14. What is Polling?

Polling is a scheme or an algorithm to identify the devices interrupting the processor. Polling is employed when multiple devices interrupt the processor through one interrupt pin of the processor.

15. What is the need for interrupt controller?

The interrupt controller is employed to expand the interrupt inputs. It can handle the interrupt request from various devices and allow one by one to the processor.

16. List some of the features of INTEL 8259 (Programmable Interrupt Controller)?

1. It manage eight interrupt request
2. The interrupt vector addresses are programmable.
3. The priorities of interrupts are programmable.
4. The interrupt can be masked or unmasked individually.

17. What is a programmable peripheral device?

If the functions performed by a peripheral device can be altered or changed by a program instruction then the peripheral device is called programmable device. Usually the programmable devices will have control registers. The device can be programmed by sending control word in the prescribed format to the control register.

18. What is synchronous data transfer scheme?

For synchronous data transfer scheme, the processor does not check the readiness of the device after a command has been issued for read/write operation. In this scheme the processor will request the device to get ready and then read/write to the device immediately after the request. In some synchronous schemes a small delay is allowed after the request.

19. What is asynchronous data transfer scheme?

In asynchronous data transfer scheme, first the processor sends a request to the device for read/write operation. Then the processor keeps on polling the status of the device. Once the device is ready, the processor executes a data transfer instruction to complete the process.

20. Explain the working of a handshake output port?

In handshake output operation, the processor will load a data to port. When the port receives the data, it will inform the output device to collect the data. Once the output device accepts the data, the port will inform the processor that it is empty. Now the processor can load another data to port and the above process is repeated.

21. What are the internal devices of 8255?

The internal devices of 8255 are port-A, port-B and port-C. The ports can be programmed for either input or output function in different operating modes.

22. What is baud rate?

The baud rate is the rate at which the serial data are transmitted. Baud rate is defined as $1 / (\text{The time for a bit cell})$. In some systems one bit cell has one data bit, then the baud rate and bits/sec are same.

23. What is USART?

The device which can be programmed to perform Synchronous or Asynchronous serial communication is called USART (Universal Synchronous Asynchronous Receiver Transmitter). The INTEL 8251A is an example of USART.

24. What are the functions performed by INTEL 8251A?

The INTEL 8251A is used for converting parallel data to serial or vice versa. The data transmission or reception can be either asynchronously or synchronously. The 8251A can be used to interface MODEM and establish serial communication through MODEM over telephone lines.

25. What are the control words of 8251A and what are its functions?

The control words of 8251A are Mode word and Command word. The mode word informs 8251 about the baud rate, character length, parity and stop bits. The command word can be send to enable the data transmission and reception.

26. What is the information that can be obtained from the status word of 8251?

The status word can be read by the CPU to check the readiness of the transmitter or receiver and to check the character synchronization in synchronous reception. It also provides information regarding various errors in the data received. The various error conditions that can be checked from the status word are parity error, overrun error and framing error

27. What are the tasks involved in keyboard interface?

The task involved in keyboard interfacing are sensing a key actuation, Debouncing the key and Generating key codes (Decoding the key). These task are performed software if the keyboard is interfaced through ports and they are performed by hardware if the keyboard is interfaced through 8279.

28. How a keyboard matrix is formed in keyboard interface using 8279?
The return lines, RLo to RL7 of 8279 are used to form the columns of keyboard matrix. In decoded scan the scan lines SLo to SL3 of 8279 are used to form the rows of keyboard matrix. In encoded scan mode, the output lines of external decoder are used as rows of keyboard matrix.
29. What is scanning in keyboard and what is scan time?
The process of sending a zero to each row of a keyboard matrix and reading the columns for key actuation is called scanning. The scan time is the time taken by the processor to scan all the rows one by one starting from first row and coming back to the first row again.
30. What is scanning in display and what is the scan time?
In display devices, the process of sending display codes to 7 –segment LEDs to display the LEDs one by one is called scanning (or multiplexed display). The scan time is the time taken to display all the 7-segment LEDs one by one, starting from first LED and coming back to the first LED again.
31. What are the modes of operation supported by 8255?
1. Simplex I/O mode
2. Strobed I/O mode
3. Bidirectional mode
32. List out three types of data transmission
1. Simplex
2. Half duplex
3. Full duplex
33. What is the usage of IRR
IRR is the register available in programmable interrupt controller. it is used to store all the interrupt levels which are requesting service. IRR is cascaded with in-service register.
34. What does it means LTM and SNGL bits are set to zero in ICW1 of 8259?
LTM=0; Edge triggered mode.
SNGL=0; cascading with other 8259's
35. What is key bouncing?
Key bouncing is the mechanical vibratory action of the contact making and breaking when keys are pressed in keyboard. Key bounce can be confused as the rapid pressing of a key. Since the circuit is rapidly switching ON and OFF
36. What is the gate signal in 8254 timer?
The gate signal is used as the gate input of counters. CLK0.CLK1 gate signals are given to counter0, counter1 and counter 2 respectively.
37. List the features of 8251
1. It is a universal synchronous and asynchronous communication controller.
2. It supports standard asynchronous protocol with
a.5 to 8 bit character format
b.odd, even or no parity generation and detection
c.automatic break detect and handling.

3. It has built in baud rate generator
4. It allows full duplex transmission
5. It provides error detection logic, which detectors parity, overrun and framing errors.
6. It has 28 pins; DIP package is available.

38. what is the internal operating frequency of the 8279?How can you derive it from any available clock signal?

The internal operating frequency of the 8279 is 100Khz. By dividing the available clock signal by the program clock word, it is obtained.

39. Name the modes of DMA operation.

Slave mode operation

Master mode operation

40. Name the six modes of operation of an 8253.. mode0- Interrut on terminal count

Mode 1- Rate generator

Mode3- Square wave generator

Mode4- Software triggered mode

Mode5-Hardware triggered mode

41. Name any two important methods available for error correction during serial communication.

1.Parity bits

2.Check sum

3.Cyclic redundancy check

4.Hamming code with 4 bit parity to encode 8 bit of data

42. What is 'cascade buffer' in 8259?

It is a storage for the interrupt signals and comparing them.

43. What is SP/EN signal in 8259?

It is a slave program enable signal. A dual functional one, which ha 2 modes namely

44. What is the use of BSR mode in 8255.

BSR mode is nothing but bit set/reset to be used for set or reset the bits in port C.

Part-B Questions

1. Draw and explain the block diagram of 8254 programmable interval timer. Also explain the various modes of operation.
2. Explain 8279 keyboard /display controller with neat block diagram.
3. Explain how to interface:
 - (i)ADC and
 - (ii) DAC
4. With neat block diagram explain the 8251 and its operating modes.
5. Draw the block diagram of I/O interface &explain in detail.
6. Explain in detail about DMA controller.
7. Explain the format of I/O mode set control and BSR control word of programmable peripheral

- interface. Explain in detail the operating modes of PPI?
8. Draw and explain the block diagram of traffic light control system.
 9. Write short notes on LED display, LCD display, Keyboard display interface.
 10. Draw and explain the block diagram of alarm controller.
 11. Compare serial and parallel interface?

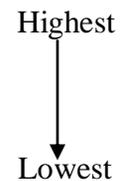
UNIT IV – MICROCONTROLLER

1. Differentiate Microprocessors and Microcontrollers

Microprocessors	Microcontrollers
It has more op-codes It has few bit handling instructions Memory, I/O devices do not present. They may be connected externally.	It has less op-codes so programming is little bit easier. It has more bit handling instructions Memory, I/O devices present in a single chip.

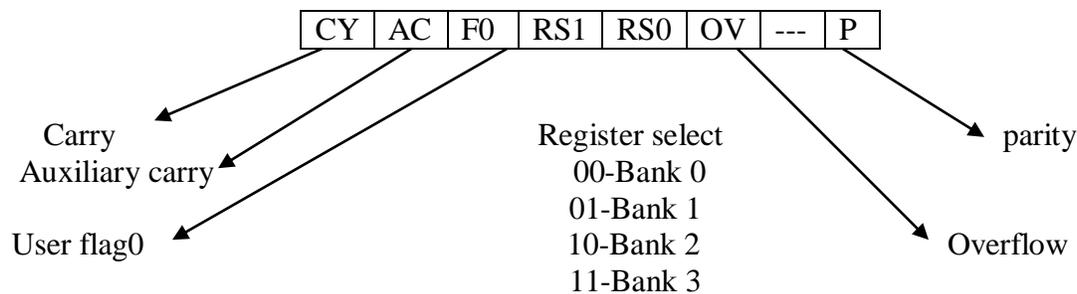
2. Name the interrupt sources of 8051 for which the priority levels are highest, lowest respectively.

1. IEO External Interrupt 0
2. TFO Timer Interrupt 0
3. IE1 External Interrupt 1
4. TF1 Timer Interrupt 1
5. Serial port Interrupt R1 or T1



3. How does the status of EA pin affect the access to internal and external program memory? If EA=0, 8051 can access the external program memory. =1, accesses the internal program memory.

4. Draw the format of PSW of 8051. Program status word (PSW)



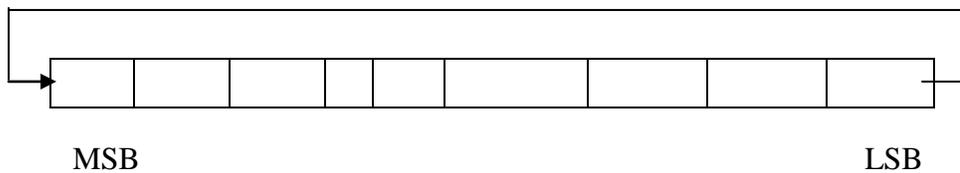
5. List the addressing mode supported by 8051.

1. Immediate addressing mode
2. Register addressing mode.
3. Direct addressing mode.
4. Register indirect addressing mode.
5. Indexed addressing mode.

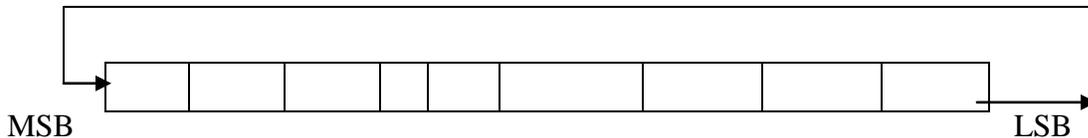
6. What are the register banks in 8051 MC?
 Register Bank 0, Bank 1, Bank 2 & Bank 3.

7. What is baud rate?
 Baud rate is used to indicate the rate at which data is being transferred.

8. Differentiate RRA and RRCA instructions in 8051 MC.
 RRA : Rotate Accumulator Right.
 Each binary bit of the accumulator is rotated right by one position. The LSB is placed in the position of MSB.



RRCA: Rotate Accumulator Right through carry.
 Each binary bit of the accumulator is rotated right by one position through the carry flag. The LSB is placed in the carry flag the carry flag is placed in MSB.



9. What are the alternate functions of Port 3 in the 8051 MC?
 P3.0-RXD P3.1-TXD P3.2-INT0 P3.3-INT1
 P3.4-T0 P3.5-T1 P3.6-WR P3.7-RD

10. What is the difference between timer and counter operation in 8051?
 The timer counts the internal clock pulses whose frequency is 1/2 th of oscillator frequency.
 The counter counts the internal clock pulses which are given through T0 pin and T1 pin of 8051.

11. What is the function of IP register in 8051?
 The IP register is used to set high priority to one or more interrupt in 8051. Setting a bit to make the corresponding interrupt to have high priority and setting a bit 0 makes the corresponding interrupt to low priority.

IP Register

---	---	---	PS	PT1	PX1	PT0	PX0
-----	-----	-----	----	-----	-----	-----	-----

12. What is the special function register available in 8051?

The 8051 operations that do not use the internal 128 byte RAM address from 00H to 7FH are done by a group of special internal registers, SFRs, which may be addressed like internal RAM.

13. What is the job of the TMOD register?

TMOD register is used to set the various timer operation modes. TMOD is dedicated solely to the two timers and can be considered to be two duplicate 4-bit registers, each of which controls the action of the timers.

14. What are the features of MC?

- 8 bit CPU with registers A and B
- 16 bit PC and DPTR
- 8 bit PSW
- 64 K Program memories.
- 64K Data memory
- 128 bytes of on chip data memory
- 32 I/O Pins for port 0, port1, Port2 & Port 3
- 2 16 bit timers, T0, T1.
- Full duplex UART; SBUF
- 2 External and three internal sources.

15. Explain the operating mode 0 of 8051 serial port?

In this serial data enters and exits through RXD, TXD outputs the shift clock. 8 bits are transmitted /received means 8 data bits. The baud rate is fixed at 1/12 the oscillator frequency.

16. Define machine cycle of 8051.

8051 machine cycle consists of 6 states, S1 through S6. One state is made up of two clock pulses. Thus 12 clock periods constitute one machine cycle. Two clock periods in a state is termed as phase 1 and phase2. what are the special function of Port 0 of 8051?

Port 0 is used as a multiplexed low –order address on port 0 pins are latched and bus is ready to act as a data bus when ALE is low.

17. What happens in power down mode of 8051 MC?

The memory locations of power down RAM can be maintained through a separate small battery backup supply so that the content of these RAM can be preserved during power failure conditions.

18. What is the function of DPTR register?

The data pointer is the 16 bit address register that can be used to fetch any 8 bit data from the data memory space. When it is not being used for this purpose, it can be used as two eight bit registers, DPH and DPL.

19. What is the branching range when an AJMP/ACALL of 8051 instruction is executed?
2Kbytes.

20. What is meant by microcontroller?

A device which contains the microprocessor with integrated peripherals like memory, serial ports, parallel ports, timer/counter, interrupt controller, data acquisition interfaces like ADC, DAC is called microcontroller.

21. List the features of 8051 microcontroller?

The features are

- *single supply +5 volt operation using HMOS technology.
- *4096 bytes program memory on chip
- *128 data memory on chip.
- *Four register banks.
- *Two multiple mode, 16-bit timer/counter.
- *Extensive boolean processing capabilities.
- *64 KB external RAM size
- *32 bidirectional individually addressable I/O lines.
- *8 bit CPU optimized for control applications.

22. Explain the operating mode 0 of 8051 serial ports?

In this mode serial enters & exits through RXD, TXD outputs the shift clock. 8 bits are transmitted/received: 8 data bits (LSB first). The baud rate is fixed at 1/12 the oscillator frequency.

23. Explain the operating mode 2 of 8051 serial ports?

In this mode 11 bits are transmitted (through TXD) or received (through RXD): a start bit (0), 8 data bits (LSB first), a programmable 9th data bit, & a stop bit (1). ON transmit the 9th data bit (TB* in SCON) can be assigned the value of 0 or 1. Or for eg., the parity bit (P, in the PSW) could be moved into TB8. On receive the 9th data bit goes into the RB8 in Special Function Register SCON, while the stop bit is ignored. The baud rate is programmable to either 1/32 or 1/64 the oscillator frequency.

24. Explain the mode 3 of 8051 serial ports?

In this mode, 11 bits are transmitted (through TXD) or received (through RXD): a start bit (0), 8 data bits (LSB first), a programmable 9th data bit, & a stop bit (1). In fact, Mode 3 is the same as Mode 2 in all respects except the baud rate. The baud rate in Mode 3 is variable. In all the four modes, transmission is initiated by any instruction that uses SBUF as a destination register. Reception is initiated in Mode 0 by the condition RI=0 & REN=1. Reception is initiated in other modes by the incoming start bit if REN=1.

25. Explain the interrupts of 8051 microcontroller?

The interrupts are:

Vector address

- External interrupt 0 : IE0 : 0003H

- Timer interrupt 0 : TF0 : 000BH
- External interrupt 1 : IE1 : 0013H
- Timer Interrupt 1 : TF1 : 001BH
- Serial Interrupt
 - Receive interrupt : RI : 0023H
 - Transmit interrupt: TI : 0023H

26. List the addressing modes of 8051?

- Direct addressing
- Register addressing
- Register indirect addressing.
- Implicit addressing
- Immediate addressing
- Index addressing
- Bit addressing

27. Write about CALL statement in 8051?

There are two subroutine CALL instructions. They are

- *LCALL(Long CALL)
- *ACALL(Absolute CALL)

Each increments the PC to the 1st byte of the instruction & pushes them in to the stack.

28. Write about the jump statement?

There are three forms of jump. They are

- LJMP(Long jump)-address 16
- AJMP(Absolute Jump)-address 11
- SJMP(Short Jump)-relative address

Part-B Questions

1. Explain the architecture of 8051 with its diagram.
2. Explain the I/O pins ports and circuit details of 8051 with its diagram.
3. Write an 8051ALP to create a square wave 66% duty cycle on bit3 of port 1.
4. With example explain the arithmetic and logic instruction of 8051 microcontroller.
5. With example explain the different instruction set of 8051 microcontroller.
6. Write a program based on 8051 instruction set to pack array of unpacked BCD digits.
7. Explain the different addressing modes of 8051
8. Write a program to bring in data in serial form and send it out in parallel form using 8051
9. Explain the data types and assembler directives of 8051
10. Explain about the register banks and special function register of 8051 in detail

UNIT V – INTERFACING MICROCONTROLLER

1. Write A program to perform multiplication of 2 nos using 8051?
MOV A,#data 1

```
MOV B,#data 2
MUL AB
MOV DPTR,#5000
MOV @DPTR,A(lower value)
INC DPTR
MOV A,B
MOVX @ DPTR,A
```

2. Write a program to mask the 0th & 7th bit using 8051?

```
MOV A,#data
ANL A,#81
MOV DPTR,#4500
MOVX @DPTR,A
LOOP SJMP LOOP
```

3. Write program to load accumulator , DPH & DPL using 8051?

```
MOV A,#30
MOV DPH,A
MOV DPL,A
```

4. Write a program to find the 2's complement using 8051?

```
MOV A,R0
CPL A
INC A
```

5. Write a program to add 2 8-bit numbers using 8051?

```
MOV A,#30H
ADD A,#50H
```

6. Write a program to swap two numbers using 8051?

```
MOV A, #data
SWAP A
```

7. Write a program to subtract 2 8-bit numbers & exchange the digits using 8051?

```
MOV A,#9F
MOV R0,#40
SUBB A,R0
SWAP A
```

8. Write a program to subtract the contents of R1 of Bank 0 from the contents of R0 of Bank 2 using 8051?

```
MOV PSW,#10
MOV A,R0
MOV PSW,#00
SUBB A,R1
```

9. What is the need of ROM chips in microprocessor?

ROM chips are needed because of the execution of data by the instruction it has.

10. List some differences between main and secondary memory.

Main memory	Secondary memory
RAM,ROM are the primary memory devices	Floppy disc/Hard disk are the secondary memory devices
It is a volatile one	It is non -volatile one
Limited memory capacity	Unlimited memory capacity

11. What do you mean by volatile?

The data can not be retained, even if the power is turned off, then it is called as volatile.

12. What do you mean by non-volatile

The data can be retained, even if the power is turned off, then it is called as non-volatile. Floppy disc, hard disc are some of the non-volatile devices(secondary storage devices).

13. Distinguish RAM & ROM.

RAM	ROM
It is a Read /Write memory	It is a Read only memory
It is high speed memory	It is low speed memory
It is volatile in nature	It is non-volatile in nature.

14. List the interrupts of 8051 microcontrollers.

Two interrupts are triggered by external signals provided by the circuitry that is connected to pins INTO bar/ INTI bar.

15. What are nested interrupts?

The 8051 is executing an ISR for servicing an interrupt and another interrupt occurs. If the new coming interrupt is high priority interrupt, then only it can interrupt the previously occurred low-priority interrupt. These are called nested interrupts.

16. Write short notes on interrupt priority.

Bit set to 1 gives the accompanying interrupt a high priority, a 0 assign slow priority, interrupts with the highest priority can interrupt another interrupt with a lower priority; the lower priority interrupt continues after the higher is finished. If two interrupts with the same priority occur at the same time, then they have the following ranking:

1.IEO 2.TFO 3.IE1 4.TFI 5.Serial =RI or TFI.

17. What are the usage of Timer and Converter?

Timer is used to convert the machine cycles and count rate is $1/12^{\text{th}}$ of the oscillator frequency. In counter mode, counter is incremented for 1 to 0 transition and it has maximum count rate as $1/24^{\text{th}}$ of oscillator frequency.

18. What are the features of ROM and RAM in 8051 microcontroller?

ROM: The 8051 has internal ROM of 4KB starting from 0000H to 0FFFH. This ROM shares same address with internal RAM but the data paths are different for both following the hardware architecture. The internal ROM is in program memory space. All instruction fetches are taken from program memory.

Part-B Questions

1. Draw the diagram to interface a stepper motor with 8051 microcontroller and explain also write an 8051 ALP to run the stepper motor in both forward and reverse direction with delay.
2. Explain how interrupts are handled in 8051.
3. Write short notes on LCD interface.
4. Write notes on 8051 serial port programming.
5. Explain about external memory interfacing to 8051
6. Write notes on 8051 timer and counter programming.
7. Draw and explain the ADC interfacing using 8051.
8. Draw and explain the DAC interfacing using 8051.
9. Explain the keyboard interfacing using 8051
10. Explain the sensor interfacing using 8051