

**ANALOG AND DIGITAL COMMUNICATION  
(ECEN 3223)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and  
any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

**Group – A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) In amplitude modulation frequency and phase of carrier  
(a) varies simultaneously  
(b) varies alternately  
(c) initially varies but become constant after sometime  
(d) remains constant.
- (ii) AM broadcast station transmits modulating frequency is 6 KHz. If carrier signal frequency is 810KHz, then upper and lower sidebands are  
(a) 816KHz and 804KHz (b) 826KHz and 804KHz  
(c) 916KHz and 904KHz (d) 822KHz and 816KHz
- (iii) To avoid slope overload in delta modulation, the maximum value of signal amplitude will be  
(a)  $sf_s$  (b)  $w/s$  (c)  $sf_s/w$  (d)  $f_s/w$   
 $s$  = Step size  $f_s$  = sampling frequency  $w$  = Signal frequency
- (iv) PCM generation requires a LPF at the beginning to  
(a) Eliminate quantization noise (b) Eliminate Aliasing effect  
(c) Eliminate decoding noise (d) None of these.
- (v) Maximum transmission efficiency of an AM modulator is?  
(a) 25% (b) 33% (c) 66% (d) 100%
- (vi) Which encoding method uses alternating positive and negative values for 1s?  
(a) NRZ (b) RZ (c) Manchester (d) AMI.
- (vii) A 10MHz carrier is frequency modulated by a sinusoidal signal of 500Hz, the maximum frequency deviation being 50kHz. The bandwidth required as given by the Carson's rule is  
(a) 105 kHz (b) 115 kHz (c) 101 kHz (d) 99 kHz.

- (viii) In a DM system, the granular noise occurs when the modulating signal
- (a) increase rapidly
  - (b) remains constant
  - (c) decreases rapidly
  - (d) the nature of modulating signal has nothing to do with this noise.
- (ix) The process of transmitting two or more information signals simultaneously over the same channel is called
- (a) telemetry
  - (b) multiplexing
  - (c) modulation
  - (d) detection
- (x) A 1000 KHz carrier is simultaneously modulated with 300 Hz and 2 KHz audio sine waves. The frequency which will not be present in the output is
- (a) 998 KHz
  - (b) 1000.3 KHz
  - (c) 999.7 KHz
  - (d) 700 KHz.

### **Group – B**

2. (a) Draw the amplitude modulated waveform for over modulation, under modulation and 100% modulation. What are ranges of modulation index in above three cases?
- (b) A broadcast radio transmitter radiates 10 KW, when the modulation percentage is 60. Determine the carrier, lower sideband, upper sideband and total sideband power.
- (c) A super heterodyne AM receiver is tuned to a signal frequency of 655 KHz. The local oscillator frequency is 1110 KHz .Find the image frequency.
- (3 + 2) + 4 + 3 = 12**
3. (a) Define frequency deviation and modulation index of a FM wave.
- (b) How frequency modulated signal can be generated using phase modulator circuit and vice versa?
- (c) In an FM system the audio frequency is 1 KHz and audio voltage is 2 volts. The deviation is 4 KHz. If the AF voltage is now increased to 8 volts and its frequency dropped to 500 Hz, find the modulation index in each case and the corresponding bandwidth using Carson's rule.
- 4 + 4 + 4 = 12**

### **Group – C**

4. (a) Explain the limitations of Delta modulation.
- (b) A television signal having a B.W of 4.2 MHz is transmitted using binary PCM system. Given that the no of quantization level is 512. Determine (i) code word length (ii) transmission B.W (iii) Final bit rate.
- 6 + 6 = 12**

5. (a) The sequence 11001011000111 is given, draw the pattern of  
(i) unipolar NRZ and RZ  
(ii) polar NRZ and RZ  
(iii) bipolar NRZ  
(iv) Manchester code
- (b) Mention the desirable properties of line code.

**8 + 4 = 12**

**Group – D**

6. (a) For a bit sequence of 100110, draw the waveform for Binary ASK, FSK and PSK modulation scheme.
- (b) Draw and label the block diagram of BFSK modulator and demodulator (asynchronous).

**6 + 6 = 12**

7. (a) What is the advantage of M ary modulation over binary modulation?
- (b) What is the limitation of QPSK? How this is solved in MSK?

**4 + (4 + 4) = 12**

**Group – E**

8. (a) Draw and label the block diagram of a FDM system.
- (b) What are the key differences between FDM and TDM systems?
- (c) What are the Salient Features of CDMA?
9. (a) Draw the cellular architecture of a mobile network.
- (b) What are the differences between First and Second Generation mobile communication system?
- (c) What are the advantages and disadvantages of Satellite Communication?

**4 + 4 + 4 = 12**

| Department & Section | Submission Link                                                                                                                                               |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EE                   | <a href="https://classroom.google.com/u/0/w/Mjk2NTIxMzM5MzQx/tc/MzY0MzQ5MTkyMTQ2">https://classroom.google.com/u/0/w/Mjk2NTIxMzZ5MzQx/tc/MzY0MzQ5MTkyMTQ2</a> |