

**ANALOG COMMUNICATION  
(ECEN 2203)**

**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) The process of transmitting two or more information signals simultaneously over the same channel is called  
 (a) telemetry (b) multiplexing  
 (c) modulation (d) detection.
- (ii) The function of the input transducer in a communication system is  
 (a) to transmit the message signal  
 (b) to modulate the message signal  
 (c) to convert message sound signal into electrical signal  
 (d) none of the above.
- (iii) In India for FM sound broadcasting system the maximum frequency deviation is  
 (a) 15 KHz (b) 200 KHz  
 (c) 75 KHz (d) 5.2 MHz.
- (iv) A 10 MHz carrier is frequency modulated by a sinusoidal signal of 500 Hz, the maximum frequency deviation being 50 kHz. The bandwidth required as given by the Carson's rule is  
 (a) 105 kHz (b) 115 kHz  
 (c) 101 kHz (d) 99 kHz.
- (v) If the modulation index of an AM signal is changed from 0 to 1, the transmitted power will be  
 (a) unchanged (b) halved  
 (c) increased by 50 % (d) quadrupled.
- (vi) The Intermediate frequency used for AM in superheterodyne receiver is  
 (a) 10.7 MHz (b) 455 KHz  
 (c) 900 KHz (d) 950 KHz.

- (vii) For Square-law diode detector the input signal voltage should be  
 (a) < 1 volt (b) > 0.6 volt  
 (c) > 0.2 volt (d) > 0.1 volt.
- (viii) The output amplitude of a frequency modulator is  
 (a) constant (b) 5V  
 (c) 8V (d) 10V.
- (ix) FM is superior to AM in the sense that  
 (a) FM is more immune to noise  
 (b) FM requires less bandwidth  
 (c) FM generation is easy  
 (d) all of these.
- (x) Preemphasis circuit is used in the  
 (a) modulator section (b) transmitter section  
 (c) receiver section (d) band pass filters.

**Group - B**

2. (a) Why is modulation of signal required for transmission?  
 (b) An amplitude modulated signal is given by  $s(t) = 10 \cos(2\pi \cdot 10^6 t) + 5 \cos(2\pi \cdot 10^6 t) \cdot \cos(2\pi \cdot 10^3 t)$ . Find the modulating signal frequency, carrier signal frequency and sideband frequencies. Determine modulation index of the system. Draw the line spectrum and find the transmission bandwidth.  
 (c) Explain with suitable phasor diagram that SSB-SC signal modulated by a single tone modulating signal does not show any amplitude variation in time domain.  
 (d) Also explain how amplitude modulation is visualized in time domain in case of multiple tone SSB-SC signal.
- 2 + 5 + 2 + 3 = 12**
3. (a) Draw the phasor diagrams of a DSB-SC modulated signal and a SSB-SC modulated signal.  
 (b) A transmitter radiates 10KW with carrier unmodulated and 12KW when carrier is sinusoidally modulated. Calculate the modulation index. If another sine wave corresponding to 50% modulation is transmitted simultaneously, determine the total radiated power.

**6 + 6 = 12**

**Group – C**

4. (a) Sketch and explain the working of a ring modulator to generate a DSB-SC signal?  
 (b) Evaluate the effect of small frequency and phase error in the local oscillator on synchronous DSB signal demodulation.

**6 + 6 = 12**

5. (a) Explain the process of SSB generation by phase shift method.  
 (b) What is the limitation of the frequency discrimination method?  
 (c) Discuss Coostas loop of carrier regeneration at the receiver in DSB SC modulation system.

**4 + 2 + 6 = 12****Group – D**

6. (a) How FM signal can be generated using phase modulator circuit and vice versa?  
 (b) Derive an expression in time domain of a single tone narrowband frequency modulated wave.  
 (c) Define frequency deviation and modulation index of a FM wave.  
 (d) 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 + 2 + 2 + 4 = 12**

7. (a) Explain FM demodulation scheme using Foster seeley discriminator.  
 (b) Compare narrow band FM with AM signal.  
 (c) Draw the phasor diagram of NBFM signal.

**6 + 3 + 3 = 12****Group – E**

8. (a) Explain the importance of Pre-emphasis and De-emphasis in FM system.  
 (b) Draw the block diagram and explain the operating principle of a TDM system.

**6 + 6 = 12**

9. (a) Draw the block diagram of a Superheterodyne Receiver.  
 (b) Define Selectivity, Sensitivity and Fidelity of a Superheterodyne Receiver.  
 (c) Explain the process of FDM using suitable block diagram.

**3 + 6 + 3 = 12**