ANALOG COMMUNICATION
(ECEN 2201)

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 band limited AM signals (FC) can be broadcasted without distortion if the system bandwidth is at least equal to the
(a) signal bandwidth (b) twice the signal bandwidth
(c) half the signal bandwidth (d) thrice the signal bandwidth.

(ii) If the radiated power of AM transmitter is 10 KW, the power in the carrier for modulation index of 0.6 is nearly
(a) 8.24 KW (b) 8.47 KW (c) 9.26 KW (d) 9.6 KW.

(iii) The Intermediate frequency used for AM in super heterodyne receiver is
(a) 10.7 MHz (b) 455 KHz (c) 900 KHz (d) 950 KHZ.

(iv) AM signal can be demodulated using Envelope dectector only if
(a) $\mu>1$ (b) $\mu<1$ (c) $\mu=0$ (d) under any circumstances.

(v) Bandwidth of SSB-SC signal is
(a) 2fm (b) fm (c) 4fm (d) 6fm.

(vi) 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.

(vii) In superheterodyne receiver, the image frequency at 1000 KHz is
(a) 1910 kHz (b) 455 KHz (c) 900 KHz (d) 950 KHZ

(viii) Maximum Power efficiency of AM is
(a) 33.33% (b) 77% (c)100% (d) 25%.

(ix) Deemphasis circuit is used in the
(a) Modulator section (b) transmitter section
(c) receiver section (d) band pass filters.

(x) In commercial TV transmission speech signals are modulated by
(a) DSB-FC (b) DSB -SC (c) SSB (d) VSB.

Group – B

2. (a) Draw and explain block diagram of communication system.

(b) Draw the time domain waveform and frequency spectrum of (i) AM (ii) DSB-SC and (iii) SSB-SC signal.

6 + 6 = 12

3. (a) Draw the phasor diagrams of a DSB-SC modulated signal and a SSB-SC modulated signal for tone modulation.

(b) Derive total transmitted power of single tone amplitude modulated signal.

(c) 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.

4 + 4 + 4 = 12

Group – C

4. (a) With proper diagram explain the operation of a balanced modulator in generation of DSB-SC signal.

(b) Determine the percentage of power saving when the carrier wave and one of the sidebands are suppressed in an AM wave modulated to a depth of (i) 100% (ii) 50%.

6 + 6 = 12

5. (a) Explain the synchronous detection of SSB-SC signal.

(b) What is pilot carrier?

(c) Discuss the effect of phase and frequency error in DSB-SC system.

4 + 2 + 6 = 12

Group – D

6. (a) Compare narrow band FM with AM signal. State Carson's rule on FM bandwidth.

(b) A 100 MHz carrier wave has a peak voltage of 5 volts. The carrier is frequency modulated by a sinusoidal modulating signal or waveform of frequency 2 KHz such that the frequency deviation is 75 KHz. The modulated waveform passes through zero and is increasing at t=0. Determine the expression for the modulated carrier waveform.

6 + 6 = 12

7. (a) Describe the process of FM generation using varactor diode modulator

   (b) Explain FM demodulation scheme using PLL

   (c) Draw the phasor diagram of NBFM signal.

5 + 5 + 2 = 12

Group – E

8. (a) Draw the block diagram of Super heterodyne receiver. What is image Frequency? Which block plays the crucial role of image frequency rejection and why?

   (b) 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 + 3) + 4 = 12

9. (a) Explain the need of pre-emphasis and de-emphasis in FM radio transmission.

   (b) Derive signal to noise ratio of DSB-SC system.

4 + 8 = 12

Department & Section	Submission Link
ECE Sec A	**https://classroom.google.com/w/MzExMTY0NzU1MDgw/tc/Mzc0MTAyMzY0NDU5**
ECE Sec B	https://classroom.google.com/w/MzA2OTczNzE3MjMw/tc/Mzc0MTA4NzQyMDM3
ECE Sec C	https://classroom.google.com/w/MjgwODI3MDM2NTEy/tc/Mzc0MTE3MjY5OTI4
BACKLOG	https://classroom.google.com/c/MjgwODI3MDM2NTEy?cjc=vnj5lul