(2066)

16049(J)    J-16

### B. Tech 4th Semester Examination

### Communication System-I (NS)

### EC-221

Time : 3 Hours                    Max. Marks : 100

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Candidate are required to attempt five question in all selecting one question from each of the section A, B, C and D and section E is compulsory. Use of non-programmable calculator is allowed.

### SECTION - A

1. (i)  Give the block diagram of communication system. Discuss each element in detail. What is modulation? Also discuss benefits of modulation.                    (5)

   (ii)  Define amplitude modulation and modulation index. Derive the power relations for single tone amplitude modulated wave.                    (5)

   (iii)  Explain the operation of square law diode modulator, which generates the AM waves. Prove with the help of derivation that it generates the AM at its output.    (5)

   (iv)  Draw the block diagram of superhetrodyne receiver and explain the function of each block in detail.    (5)

2. (i)  What is meant by term base band transmission? Also explain different types of channels used in communication.                    (5)

   (ii)  A carrier wave of 10MHz is amplitude modulated to 50% level with a tone of 5000Hz. Sketch the AM wave. Assuming carrier amplitude is 10V. Write the equation of above wave and show the existence of two sidebands. Determine frequency and amplitude of both sidebands. (5)

   (iii)  What is meant by double side band suppressed carrier (DSB-SC) signal? How can you obtain DSB-SC signal?                    (5)

   (iv)  Draw the diagram of linear diode detector and also explain its working.                    (5)

### SECTION - B

3. (i)  What do you mean by phase modulation? Also derive an expression for a single tone phase modulated wave.  (5)

   (ii)  A 20MHz carrier is modulated by a 400Hz audio sine wave. If the carrier voltage is 5V and maximum deviation is 10kHz, write the equation for this frequency modulated wave. If the modulating frequency is now changed to 2 kHz and carrier voltage is changed to 10V, all else remaining constant, write a equation for this wave, calculate the power dissipated across 100 ohm resistor by both the FM waves.                    (5)

   (iii)  Explain direct method of FM generation with help of circuit diagram.                    (5)

   (iv)  What is pre-emphasis? Why is it used? Sketch the circuit of pre-emphasis. Explain why de-emphasis must also be used.                    (5)

4. (i)  An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^6$, described by the equation:

   $S(t) = 10\cos(\omega_c t + 0.1 \sin 2000\pi t)$

   Find: (a) modulating frequency, (b) modulation index, (c) frequency deviation, (d) power dissipated in 10 ohm resistor                    (6)

(ii) With the help of block diagram, explain indirect method for FM generation. Also explain its working. Also discuss the disadvantages of direct FM transmitters. (6)

(iii) Sketch the circuit diagram of Foster-Seeley discriminator and explain how it demodulates an FM signal? (8)

## SECTION - C

5. (i) Why do you mean by SSB-SC signal? Discuss phase discriminator method for generation of SSB-SC signal. (5)

(ii) Discuss briefly about vestigial sideband modulation. Why is VSB modulation used in TV transmission? (5)

(iii) What is the difference between ideal and practical sampling? Explain the natural sampling and draw the spectrum of naturally sampled signal. (5)

(iv) Define Pulse Amplitude Modulation (PAM) and explain its generation and detection. (5)

6. (i) What do you mean by Independent Side-band System (FSB). Explain it. (5)

(ii) Draw the waveform of SSB signal with respect to time. What is the bandwidth of SSB-signal? Why is SSB not used for broadcasting? (5)

(iii) Explain the flat top sampling. State its advantages over natural sampling. And draw the spectrum of flat top sampled signal. (5)

(iv) What do you mean by PWM? Explain the generation and detection of PWM signal. (5)

## SECTION - D

7. (i) Draw the block diagram of telephone set. Explain the function and basic operation of the following telephone set components: ringing circuit, on/off hook circuit, equalizer circuit, speaker, microphone, hybrid network and dialing circuit. (10)

[P.T.O.]

(ii) Describe basic telephone call procedures. (5)

(iii) Describe the basic principles of paging system. (5)

8. (i) Explain telephone message-channel noise and C-message noise weighting. (5)

(ii) Describe what is meant by a two wire voice frequencies circuits and four wire voice frequency circuits. (5)

(iii) Describe the necessity for central office telephone exchanges. (5)

(iv) What are the two types of subscribers to the public telephone network? Briefly describe them. (5)

## SECTION - E

9. (i) How is the height of antenna related to modulation? Also explain how modulation helps in reducing the height of antenna. (2)

(ii) How many AM broadcast stations can be accommodated in 10kHz bandwidth if the highest frequency modulating a carrier is 5kHz. (2)

(iii) If $f_1$ and $f_2$ are the input frequencies to an ideal balanced modulator, what are the frequencies at its output? (1)

(iv) What do you mean by sensitivity? (2)

(v) Why is FM not used for picture transmission? (2)

(vi) State Carson's rule for bandwidth of FM wave. (2)

(vii) Calculate the percent power saving for the SSB signal if the AM wave is modulated to a depth of 50%. (2)

(viii) State the disadvantages of PAM. (1)

(ix) Determine the power level in dbm for signal levels of 1mw and 1μw. (2)

(x) What is meant by far-end crosstalk? (2)

(xi) Write the advantages of superhetrodyning. (2)