[This question paper contains 6 printed pages.]

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. There are **7** questions in all out of which you have to answer any **5**.

3. **All** questions carry equal marks.

4. Use of scientific calculators is allowed.

1. (a) Give any three reasons that justify the need for modulation. What is the VHF range? Give any application that utilizes this range of frequencies.

(6)

P.T.O.

(b) Discuss the working of an envelope detector. Derive an expression for the optimum value of the time constant in terms of the modulation index and modulating frequency. (5)

(c) A modulating signal of 1 KHz modulates a carrier signal having peak amplitude of IV and 1MHz frequency. The modulation index of the AM signal is 0.5. Draw the corresponding frequency spectrum. Find the bandwidth of the AM signal. (4)

2. (a) How is the SSBSC signal generated using Phase Shift Method? (6)

(b) What is pilot carrier modulation? How does it remove the difficulties of suppressed carrier modulation? (5)

(c) The power transmitted by a SSB transmitter is 10KW. It is required to be replaced by standard AM transmission having modulation index of 0.8 and same power. Determine the power contents of the carrier and each of the sidebands. (4)

3. (a) Explain the indirect method of FM generation with the help of a block diagram. (6)

(b) Differentiate between the Amplitude Modulation and Frequency Modulation. (5)

(c) An anglemodulated signal is given by

$$s(t) = 5 \cos [2\pi(10^6)t + 0.2 \cos 200 \pi t]$$

Determine the following :

(i) Carrier frequency

(ii) Modulation frequency

(iii) Modulation index

(iv) Maximum deviation (4)

4. (a) What are the advantages of Wide Band FM over Narrow Band FM? (6)

(b) What are Pre-emphasis and De-emphasis circuits? Where and why are they used? (5)

(c) A carrier is frequency modulated with a sinusoidal signal of 2 KHz, resulting in maximum frequency deviation of 5 KHz.

   (i) Find the bandwidth of the modulated signal.

   (ii) The amplitude of the modulating sinusoidal is increased by a factor of 3. What will be the maximum frequency deviation and bandwidth of the new modulated signal?

(4)

5. (a) Explain with the help of a block diagram, the Superheterodyne AM receiver. (6)

(b) What is noise? Discuss the various types of noise which may be created within the receiver.

(5)

(c) A mixer stage has a noise figure of 20dB and this is preceded by an amplifier that has a noise figure of 9dB and an available power gain of 15 dB. Calculate the overall noise figure referred to the input. (4)

6. (a) Compare the four pulse modulation schemes. Which of these pulse modulation schemes is digital in nature. Discuss, with suitable diagrams, generation and detection of any one of them. (6)

(b) What is aliasing and how can it be removed? What causes aperture effect and how can it be reduced? (5)

(c) Find the Nyquistrate and Nyquist interval for the signal :

$$x(t) = \cos(4000\pi t) + \cos(1000\pi t)$$ (4)

7. (a) Explain quantization. What is the need for non-uniform quantization? Explaincompanding. (6)

(b) What are the advantages and disadvantages of digital communication over analog communication. (5)

(c) Sketch the line coding for the binary data string :

1 1 0 0 1 0 1 0 for

(i) Polar RZ

(ii) Polar NRZ

(iii) Manchester coding

(iv) Differential coding   (4)