

[This question paper contains 6 printed pages.]

Your Roll No. 17009558026

Sr. No. of Question Paper : 2036

A

Unique Paper Code : 32511608-OC

Name of the Paper : Communication Electronics
(Core)

Name of the Course : B.Sc. (H) Electronics

Semester : VI

Duration : 3½ Hours

Maximum Marks : 75

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) Define modulation. Draw the block diagram of an electronic communication system. What is the frequency range of UHF.

(6)

P.T.O.

(b) Discuss the generation of a Double Side Band Full Carrier Amplitude Modulated Signal using the balanced modulator. (5)

(c) The antenna current of an AM broadcast transmitter, modulated to a depth of 50 percent by an audio sine wave is 10 A. It increases to 13A as a result of simultaneous modulation by another audio sine wave. What is the modulation index due to the second wave? (4)

2. (a) A message signal represented by the equation :

$$V_m = 5\sin(2\pi 10^2 t)$$

is modulated by a sinusoidal carrier given by

$$V_c = 10\sin(27\pi 10^6 t).$$

Compare the power and bandwidth requirements if the modulation is carried out in the following systems: Double Sideband Full Carrier, Double Sideband Suppressed Carrier and Single Sideband Suppressed Carrier. (6)

(b) Outline the filter method for the generation of SSBSC. Mention any two limitations of the filter method. (5)

- (c) What is Vestigial Side Band AM? Give any example where this form of AM is used. (4) ✓

3

- (a) Describe Frequency and Phase Modulation. Explain how FM can be generated using Phase Modulation. (6) ✓

- (b) What are the similarities and differences between FM and PM systems? (5) ✓

- (c) A single tone FM is represented by the voltage equation as :

$$V(t) = 12\sin(6 \times 10^8 t + 5\sin 1250t)$$

Determine the following :

(i) Carrier frequency

(ii) Modulation frequency

(iii) Modulation index

(iv) Maximum deviation (4) ✓

4. (a) What are the advantages and disadvantages of direct method for generation of FM signal? (6)

(b) Discuss the working of the Phase Locked Loop for demodulating an FM signal. (5)

(c) In a Frequency Modulated system, when the audio frequency is 500 Hz, and the audio frequency voltage is 2.4 V, the frequency deviation is 4.8 KHz. If the audio frequency voltage is further raised to 10 V while the audio frequency is dropped to 200Hz, calculate :

(i) the frequency deviation

(ii) the modulation index.

(4)

5.

(a) Define signal to noise ratio and noise figure of a receiver. Derive an expression for the overall noise factor of a system comprising of two amplifiers in a cascade. (6)

(b) Differentiate between low level and high level modulation with the help of suitable block diagrams. (5)

(c) Two resistors of $20\text{ K}\Omega$ and $50\text{ K}\Omega$ are at room temperature 290°K . For a bandwidth of 100 KHz, calculate the thermal noise voltage for the following :

(i) For each resistance

(ii) For the two resistances in series. (4)

6/ (a) State and prove the sampling theorem. With the help of diagrams differentiate between flat top sampling and natural sampling. (6)

(b) Discuss the generation and detection of pulse width modulation (PWM) and sketch the corresponding waveforms. What are the disadvantages of PWM? (5)

(c) An analog signal with fundamental frequency of 500 Hz needs to include up to its 6th harmonic to be defined completely. Identify the cut-off frequency of the pre-aliasing filter required before sampling. Also identify the Nyquist frequency of sampling. If a guard band of 0.25 kHz is required what should be the sampling frequency? (4)

7. (a) With the help of diagrams, explain the pulse code modulation system. (6)

(b) Explain Delta modulation. What is slope overload and granular noise in Delta modulation? (5)

(c) A television audio and video signal of 4.5 MHz is converted to a PCM bit stream. Given that the number of quantization levels is 1024, determine:

- (i) Minimum sampling rate of the signal
- (ii) Code word length
- (iii) The number of bits per second
- (iv) Signal to quantization noise ratio. (4)

1
2
3
4
5