

9102

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Under NEP UGCF Mode Semester VI

Unique Paper Code: 2514000025

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

Name of the Paper: Communication Systems

Duration: 3 Hours

Maximum Marks: 90

Instruction for Candidates

Attempt five questions in all. Question No. 1 is Compulsory. All questions carry equal marks. Use of a Non-programable scientific calculator is allowed.

Q 1

- (a) What is the bandwidth requirement for transmission of: (i) Human voice (ii) Music signal and (iii) video signal? (3)
- (b) What are the various types of external noise? (3)
- (c) Calculate the percentage of modulated power saved in SSBSC as compared to DSBFC. (3)
- (d) What are the similarities and differences between FM and a PM system? (3)
- (e) What is pilot carrier transmission explain? (3)
- (f) Regenerative repeaters are an inherent part of PCM systems. Explain. (3)

Q2

- (a) What are the basic constituents of a communication system? What is simplex, Half duplex and Full duplex classification based on? (6)
- (b) What is Thermal Noise. How does the thermal noise depend on the bandwidth and ambient temperature? Also derive the formula for noise voltage for resistors in series and resistors in parallel. (6)
- (c) Two resistors, 30 k Ω and 60 k Ω are at room temperature (290K). Calculate for a bandwidth of 100 KHz, the thermal noise voltage (i) for each resistor, (ii) for two resistors in series, and (iii) for two resistors in parallel. (6)

Q3

- (a) A sinusoidal carrier has amplitude of 10V and frequency 30 KHz. It is amplitude modulated by sinusoidal voltage of amplitude 3V and frequency 1KHz. (6)
 - (i) Write the equation for the modulated wave.
 - (ii) Plot the modulated wave showing the maxima and minima of waveforms.
 - (iii) Determine the modulation index.Draw the spectrum of modulated wave.
- (b) State three important reasons why modulation is necessary for transmitting message signals. Explain how a balanced modulator can be used to generate a Double sideband suppressed carrier. (6)
- (c) Explain the phase shift method for generation of SSB signal using block diagram only. Also identify which sideband is being suppressed. (6)

Q 4

- (a) Derive optimum value of the time constant for a linear diode detector. (6)
- (b) An amplitude modulated wave $10[1 + 0.6 \cos 2\pi 10^3 t] \cos 2\pi 10^6 t$ is to be detected by a linear diode detector. Find (a) the time constant τ , (b) the value of resistance R if capacitor used is 100pF. (6)
- (c) Derive a formula for the instantaneous value of a frequency modulated wave and define modulation index of frequency modulation. (6)

Q 5

- (a) A FM wave is represented by the following equation (6)

$$10 \sin[5 \times 10^8 t + 4 \sin 1250 t]$$

Find (i) Carrier and modulating frequencies.

(ii) Modulation index and maximum deviation

(iii) The power dissipated in a 5Ω resistor.

- (b) Differentiate between low level and high-level modulation with the help of suitable block diagrams for an AM transmitter. (6)
- (c) Draw and explain the block diagram of FM receiver (6)

Q6

- (a) Pulse amplitude modulation is obtained by lengthening of duration of each sample of an instantaneous sampled signal explain. Derive the necessary formulae. (6)
- (b) With help of waveforms explain the difference between a PAM, PWM and PPM (6)
How can one obtain PPM from PWM? Why is noise immunity of PWM better than PAM?
- (c) For a PAM transmission of voice signal having maximum frequency, $f_m = 3100$ Hz, calculate the transmission bandwidth if sampling frequency, $f_s = 8$ KHz and pulse width, $\tau = 0.1T_s$ (6)

Q7

- (a) 'A sampled signal cannot be called a digital signal' Justify. What additional processes are required for converting it into a PCM signal? Give the necessary block diagram. What is the difference between uniform and non-uniform quantization in PCM systems. (6)
- (b) What is companding explain. Giving the formulae and the graph, bring out the difference between the A-Law and μ -Law. (6)
- (c) Encode the data stream '11010010' into RZ, BRZ, NRZ and split phase Manchester code (6)