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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

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| Ques. 1 | (a) What is Internal Noise. Give any two examples. | 3 |
| | (b) Why is modulation necessary for the transmission of signals? | 3 |
| | (c) What is over-modulation. Draw an over-modulated Amplitude Modulated Signal in the time domain. Also, draw the corresponding trapezoid. | 3 |
| | (d) List two advantages and two disadvantages of Frequency Modulation over Amplitude Modulation. | 3 |
| | (e) An amplitude modulated signal is being transmitted at a frequency of 650 KHz. What is the frequency of the image signal that must be rejected by the receiver? | 3 |
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| Ques. 2 | (a) What is the VHF range? Give any application that utilizes this range of frequencies. What are the channels that can be used for the propagation of this frequency range. | 9 |
| | (b) What is shot noise. Calculate the shot noise component of current present on a direct current of 1mA flowing across an abrupt semiconductor junction, given that the effective noise bandwidth is 1 MHz. | 9 |
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| Ques. 3 | (a) A sinusoidal carrier wave has an amplitude of 10V and frequency of 30 KHz. It is amplitude modulated by a sinusoidal voltage of amplitude 3V and frequency 1KHz. The modulated voltage is developed across 50Ω resistance. | 4 |
| | (i) Write the equation for the modulated wave. | |
| | (ii) Plot the modulated wave showing maxima and minima of waveform. | |
| | (iii) Determine the modulation index. | |
| | (iv) Draw the spectrum of the modulated wave. | |

- (b) Describe vestigial sideband transmission. Give its applications. 7
- (c) Explain the working of a collector modulator circuit for generation of an amplitude modulated wave. Also find the expression of modulator output power. 7
- Ques. 4 (a) Determine the condition to avoid diagonal peak clipping in diode detector. 4
- (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 R if capacitor used is 100pF. 7
- (c) List the three methods that can be used for the generation of Single Side Band Suppressed Carrier Signals. Draw the block diagram of the phase cancellation SSB generator and explain how the carrier and unwanted sideband are suppressed. 7
- Ques. 5 (a) Is it possible to achieve FM via PM (Phase Modulation)? Draw the block diagram and explain the underlying principle. 6
- (b) Encode the data stream '11010010' into RZ, BRZ, NRZ and split phase Manchester code 6
- (c) What determines the bandwidth used by any given FM communication system? A modulating signal $5 \cos 2\pi(15 \times 10^3)t$ angle modulates a carrier $A \cos \omega_c t$ 6
- (i) If $K_f = 15 \text{ KHz/V}$ and $K_p = 15 \text{ rad/V}$, find the modulation index and bandwidth for
- I. The FM system
- II. The PM system
- (ii) Determine the change in the bandwidth for both FM and PM if f_m is reduced to 5 KHz.
- Ques. 6 (a) What are Pre-emphasis and De-emphasis circuits? Where and why are they used? 4
- (b) In a Frequency Modulated signal, the total carrier power is redistributed between all components of the spectrum. Explain. 7

- (c) Discuss the working of a phase locked loop demodulator used for demodulation of an FM signal. Why is PLL considered the best frequency demodulator? 7
- Ques. 7 (a) When a Super Heterodyne receiver is tuned to 555 KHz, its local oscillator provides the mixer with an input at 1010 KHz. The antenna of this receiver is connected to the mixer via a tuned circuit whose loaded Q is 40. What will be the rejection ratio of the image frequency? 4
- (b) What is the use of a squelch circuit in a communication receiver? Explain what is meant by double spotting. 7
- (c) Differentiate between low level and high level modulation with the help of suitable block diagrams. In a Super Heterodyne AM receiver, what are the factors that limit the choice of the intermediate frequency. 7