

Roll No.

Total Pages : 04

BT-4/M-23

44181

BASICS OF COMMUNICATION
ES-IT-202A

Time : Three Hours]

[Maximum Marks : 75

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Discuss the types, causes and effects of the various forms of noise which may be created within a receiver or an amplifier. 7
(b) Ignoring the constant relative amplitude component, plot and add the appropriate sine waves graphically, in each case using the first four components, so as to synthesize (a) a square wave, (b) a sawtooth wave. 8
2. (a) The RF amplifier of a receiver has an input resistance of $1000\ \Omega$, and equivalent shot-noise resistance of $2000\ \Omega$, a gain of 25, and a load resistance of $125k\ \Omega$. Given that the bandwidth is 1.0 MHz and the temperature is 20°C , calculate the

equivalent noise voltage at the input to this RF amplifier. If this receiver is connected to an antenna with an impedance of 75Ω , calculate the noise figure. 8

- (b) Prove that "The makeup of a square or rectangular wave is the sum of (harmonics) the sine wave components at various amplitudes". 7

Unit II

3. (a) A transistor class C amplifier has maximum permissible collector dissipation of 20 W and a collector-efficiency of 75 percent. It is to be collector-modulated to a depth of 90 percent. (a) Calculate (i) the maximum unmodulated carrier power and (ii) the sideband power generated. (b) If the maximum depth of modulation is now restricted to 70 per cent, calculate the new maximum sideband power generated. 8
- (b) With waveforms, explain how a suitable train of current pulses fed to a tuned circuit will result in an amplitude-modulated output wave. 7
4. (a) When the modulating frequency in an FM system is 400 Hz and the modulating voltage is 2.4 V, the modulation index is 60. Calculate the maximum deviation. What is the modulation index when the modulating frequency is reduced to 250 Hz and the modulating voltage is simultaneously raised to 3.2 V ? 8

- (b) Derive the formula for the instantaneous value of an FM voltage and define the modulation index. 7

Unit III

5. (a) When a superheterodyne receiver is tuned to 555 kHz, its local oscillator provides the mixer with an input at 1010 kHz. What is the image frequency ? 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 for the calculated image frequency ? 7
- (b) Explain what double spotting is and how it arises. What is its nuisance value ? 8
6. (a) With the aid of the block diagram of a simple receiver, explain the basic superheterodyne principle. 7
- (b) Describe the differences between FM and AM receivers, bearing in mind the different frequency ranges and bandwidths over which they operate. 8

Unit IV

7. (a) Differentiate between step index and graded index fiber. How the rays do propagate in graded index fiber ? 8

- (b) Explain the working principle of LED. How the quantum efficiency of a LED is defined ? List out various parameters which are needed to be optimized for getting maximum output power from the LED.

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8. (a) What is the difference between acceptance angle, critical angle and numerical aperture ? A step index fiber has a core and cladding refractive index of 1.50 and 1.46 respectively. What is the value of numerical aperture and acceptance angle of the fiber ?

8

- (b) What do you understand by scattering loss ? Describe its types with expressions.

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