

9. (a) Explain DSB-SC modulation scheme. 4
(b) Explain the phase locked loop (PLL) demodulator. 4
(c) Explain in detail the correlation of power signals. 4
(d) Explain the low and high frequency noise in communication. 3

Roll No.

Total Pages : 04

MAR-21-210058

B. Tech. EXAMINATION, March 2021

Semester IV (CBCS)

ANALOG COMMUNICATION

EC-401

Time : 2 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from each Sections A, B, C and D. All questions carry equal marks.

Section A

1. Explain the need of modulation in a communication system. Explain, what is electromagnetic spectrum. **15**
2. Derive the relationship between cross-correlation function and cross power spectral density function. State the properties of power spectral density. **15**

Section B

3. Derive the expression for noise figure for a cascade stages. An amplifier when used with a source of average noise temperature 60 K, has an average operating noise figure of 5. What is the equivalent temperature of the amplifier in Kelvin ? **15**

4. The joint probability density function of two random variables X and Y is given as :

$$f_{XY}(x, y) = C(2x + y), \quad \text{for } 0 \leq x \leq 2, 0 \leq y \leq 3 \\ = 0, \quad \text{elsewhere}$$

Determine the value of constant C. Explain the properties of joint PDF. **15**

Section C

5. Define Amplitude Modulation. Write expression for (i) modulation index (ii) efficiency of AM wave. Discuss any *one* method of generation of SSB waves ? **15**
6. A given AM broadcast station transmits a total power of 30 kW when the carrier is modulated by a sinusoidal signal with a modulation index of 0.707. Calculate :

- (a) the carrier power
(b) the transmission efficiency
(c) the peak amplitude of the carrier assuming the antenna to be represented by $(30 + j0)$ load. **15**

Section D

7. A 107.6 MHz carrier signal is frequency modulated by a 7 kHz sine wave. The resultant FM signal has a frequency deviation of 50 kHz. Determine the following :
- (a) The carrier swing of the FM signal.
(b) The highest and the lowest frequencies attained by the modulated signal.
(c) The modulation index of the FM wave. **15**
8. (a) Explain the working of Ratio detector with the help of block diagram. **9**
(b) Given an angle modulated signal :
$$X(t) = 10 \cos \left[(10^6) \pi t + 5 \sin 2\pi (10^3) t \right]$$
Determine the maximum phase deviation and the maximum frequency deviation. **6**