



# CBCS SCHEME

15EC45

## Fourth Semester B.E. Degree Examination, Aug./Sept. 2020 Principles of Communication Systems

Time: 3 hrs.

Max. Marks: 80

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Derive the expression for transmission band width of a standard –Am wave using frequency domain description. (06 Marks)
- b. Discuss the role of ‘ $\phi$ ’ in the coherent detection of DSBSCM – wave. (06 Marks)
- c. Carrier wave with amplitude 12V and frequency 10MHz is amplitude modulated to 50% with message signal frequency 1KHz. Draw the spectrum and calculate the bandwidth  $B_T$ . (04 Marks)

OR

- 2 a. Derive the condition for  $H(f)$  of a BPF that shapes DSBSCM–wave into a VSBM-wave. (06 Marks)
- b. Discuss the requirements that a message signal and BPF has to fulfill to generate SSBM – signal from a DSBSC-wave. (06 Marks)
- c. Assuming message signal with  $W = 2\text{KHz}$  draw the spectrum of a DSBSCM wave for  $f_c = 4\text{KHz}$  and  $f_c = 1.5\text{KHz}$  separately. (04 Marks)

### Module-2

- 3 a. Discuss the transmission–bandwidth approximation rules for single–tone FM–wave. (06 Marks)
- b. Derive the expression for a NBFM – wave using single–tone message signal. (06 Marks)
- c. Explain FM – stereo multiplexing. (04 Marks)

OR

- 4 a. Prove that under lock – condition the response of a linear – PLL is a scaled version of the message signal. (08 Marks)
- b. Derive the condition for eliminating the unwanted – components if an FM wave is transmitted over a non linear channel. (08 Marks)

### Module-3

- 5 a. List out the properties of the auto correlation function. (06 Marks)
  - b. Discuss the first two moments of the pdf of a random – variable X. (06 Marks)
- If  $Y = g(x) = \cos(X)$ , where  $X \rightarrow$  is a random variable uniformly distributed in the interval  $(-\pi, \pi)$  ie

$$f_X(x) = \begin{cases} \frac{1}{2\pi} & -\pi < x < \pi \\ 0 & \text{otherwise} \end{cases}$$

Find the expected value of Y.

(04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. In brief discuss the  
 i) Thermal noise  
 ii) Shot noise. (06 Marks)
- b. Write Gaussian noise  $w(t)$  of zero mean and  $\text{psd} = \frac{N_0}{2}$  is applied to an ideal – LPF of bandwidth  $B$  and pass band response of one. Find the :  
 i) Psd of the noise  $n(t)$   
 ii) Auto correlation function of  $n(t)$ . (06 Marks)
- c. Write a short note on : “Noise Figure”. (04 Marks)

**Module-4**

- 7 a. Derive the expression for  $(\text{SNR})_0$  using BSBSC – Model. (08 Marks)
- b. Write short note on :  
 i) Capture effect  
 ii) Threshold effect  
 In FM receivers. (08 Marks)

OR

- 8 a. Derive the expression for  $(\text{SNR})_0$  using FM – system. (08 Marks)
- b. Write short note on :  
 i) Pre-emphasis  
 ii) De-emphasis. (08 Marks)

**Module-5**

- 9 a. List out the advantages and limitations of digital system over analog system. (08 Marks)
- b. Explain the method of generation and recovery of PPM signal. (08 Marks)

OR

- 10 a. Explain the PCM-system. (08 Marks)
- b. Write short note on :  
 i) Regeneration  
 ii) VOCODER. (08 Marks)

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