

CBCS SCHEME

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15EC45

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019 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. Define amplitude modulation. Derive the expression on AM by both time domain and frequency domain representation with necessary waveforms. (08 Marks)
b. Explain how RING modulator can be used to generate DSB-SC modulation. (08 Marks)

OR

- 2 a. An audio frequency signal $5 \sin 2\pi(1000t)$ is used to amplitude modulate a carrier of $100 \sin 2\pi(10^6t)$. Assume modulation index of 0.4. Find :
i) Sideband frequencies
ii) Bandwidth required. (02 Marks)
b. Explain the scheme for generation and demodulation of VSB modulated wave, with relevant spectrum of signals in the demodulation scheme. Give relevant mathematical expressions. (08 Marks)
c. With a neat block diagram, explain the operation of FDM technique. (06 Marks)

Module-2

- 3 a. Describe with necessary equations and phasor diagram, the generation of Narrow Band FM(NBFM). (08 Marks)
b. Explain the direct method of generating FM waves. (06 Marks)
c. A FM signal has sinusoidal modulation with $W = 15\text{KHz}$ and modulation index $\beta = 2$. Using Carson's rule, find the transmission bandwidth and deviation ratio. Assume $\Delta f = 75 \text{ KHz}$. (02 Marks)

OR

- 4 a. Explain with relevant block diagram and mathematical expression, the demodulation of a FM signal using non-linear and linear model of the PLL. (10 Marks)
b. Draw the block diagram of a super heterodyne receiver and explain the function of each section. (06 Marks)

Module-3

- 5 a. Define probability theory. Explain conditional probability. (06 Marks)
b. Describe mean, auto correlation and co-variance functions with respect to random process. (04 Marks)
c. Explain the properties of auto correlation function. (06 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. A random variable has probability function :

$$f(x) = \begin{cases} \frac{5(1-x^4)}{4} & ; 0 \leq x \leq 1 \\ 0 & ; \text{elsewhere} \end{cases}$$

Find : i) $E(x)$ ii) $E(4x + 2)$ iii) $E(x^2)$. (06 Marks)

- b. Explain the following :
 i) Short Noise ii) Thermal Noise iii) White Noise iv) Noise Figure v) Noise Equivalent Bandwidth. (10 Marks)

Module-4

- 7 a. Derive the expression for the FOM of DSB – SC receiver. (08 Marks)
 b. Derive the expression for the FOM of an AM receiver. (08 Marks)

OR

- 8 a. In AM receiver, find the Figure of Merit (FOM) when the depth of modulation is :
 i) 50% ii) 100%. (02 Marks)
 b. Explain the working of pre-emphasis and de-emphasis in FM. (06 Marks)
 c. Derive the expression for the FOM of an FM receiver. (08 Marks)

Module-5

- 9 a. Mention the advantages of digital communication system. (04 Marks)
 b. State and prove sampling theorem and reconstruction of lowpass signal using Nyquist Criterion. (12 Marks)

OR

- 10 a. With a neat block diagram, explain the operation of TDM. (06 Marks)
 b. With a neat block diagram, explain the concept of PCM. (10 Marks)
