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 = 15KHz and modulation index $\beta = 2$. Using Carson's rule, find the transmission bandwidth and deviation ratio. Assume $\Delta f = 75$ 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)**

OR

6 a. A random variable has probability function :

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

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 Nose 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)**

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