CBCS SCHEME

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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 = 2KHz draw the spectrum of a DSBSCM wave for $f_C$ = 4KHz and $f_C$ = 1.5KHz 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 – sterio 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)**

**OR**

6 a. In brief discuss the
i) Thermal noise
ii) Shot noise. **(06 Marks)**

b. Write Gaussian noise w(t) of zeromean and 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 $(SNR)_0$ 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 $(SNR)_0$ 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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