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15EC45

## Fourth Semester B.E. Degree Examination, Feb./Mar. 2022

### 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. Explain in detail the working of switching modulator with suitable diagram and necessary derivations. (07 Marks)
- b. An audio frequency signal  $5\sin 2\pi (1000)t$  is used to amplitude modulated carrier of  $100 \sin 2\pi (10^6)t$ . Assume modulation index as 0.4. Find :
  - i) Amplitude of each side band
  - ii) Bandwidth required
  - iii) Sideband frequencies(04 Marks)
- c. Explain the generation of PSB-SC modulated using ring modulator. (05 Marks)

OR

- 2 a. With block diagram, explain the working of quadrature carrier multiplexing. (06 Marks)
- b. Give the comparison of various amplitude modulation techniques. (05 Marks)
- c. With relevant block diagram, explain the working of FDM system. (05 Marks)

#### Module-2

- 3 a. Explain the generation of frequency modulated wave by direct method. (06 Marks)
- b. Explain how practically the bandwidth of FM is finite. (05 Marks)
- c. Explain the nonlinear effects in FM. (05 Marks)

OR

- 4 a. Explain the nonlinear model of PLL with relevant block diagram and derivations. (06 Marks)
- b. Explain the working of super hetero dyne receiver. (04 Marks)
- c. With the help of block diagram, explain the working of FM stereo multiplexing. (06 Marks)

#### Module-3

- 5 a. Define autocorrelation function. Explain its important properties. (06 Marks)
- b. Explain the following terms
  - i) conditional probability
  - ii) cumulative distribution function
  - iii) joint probability density function.(06 Marks)
- c. Describe mean covariance function with respect to stationary random process. (04 Marks)

OR

- 6 a. Define Noise equivalent bandwidth and derive the expression you the same. (06 Marks)
- b. Define short noise, white noise and thermal noise. (06 Marks)
- c. Suppose amplifier 1 has noise figure of 9dB and power gain of 15dB. It is connected in cascade to the other amplifier 2 with noise figure of 20dB. Calculate the overall noise figure for this cascade connection in decibel units. (04 Marks)

**Module-4**

- 7 a. Explain the noise in AM receivers and derive the equation for signal to noise ratio of an AM receiver, along its figure of merit. (08 Marks)
- b. Explain the noisy model of FM receiver and derive an equation for figure of merit for Frequency Modulation. (08 Marks)

**OR**

- 8 a. Explain about the FM threshold effect and its reduction method. (08 Marks)
- b. Why pre-emphasis and de-emphasis are required? Explain how they are implemented. (08 Marks)

**Module-5**

- 9 a. State and prove sampling theorem for band limited signals. (08 Marks)
- b. Explain the generation and detection of PPM. (08 Marks)

**OR**

- 10 a. What is Quantization noise? Derive the output signal to noise ratio of a uniform quantizer. (08 Marks)
- b. Explain the generation and reconstruction of a PCM signal. (08 Marks)

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