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17EC44

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 Principles of Communication Systems

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Illustrate the amplitude modulation process. What is envelope distortion? (10 Marks)
- b. With the aid of neat block diagram, describe coherent detection of DSB-SC modulated wave. What is quadrature null effect? (07 Marks)
- c. A single of 5KHz frequency signal is modulated on a carrier wave of a frequency 2 MHz. What are the frequencies of the resultant signal? (03 Marks)

OR

- 2 a. Describe ring modulator. Why the ring modulator is referred as a double balanced modulator? (10 Marks)
- b. Describe quadrature carrier multiplexing. (06 Marks)
- c. What are the factors influencing the choice of VSB modulation for the transmission of analog TV signals? (04 Marks)

Module-2

- 3 a. Derive an expression for FM signal. (08 Marks)
- b. With the aid of neat block diagram, explain AM super heterodyne receiver. (08 Marks)
- c. The resulting FM signal is $10 \cos[(2\pi \cdot 10^5 t) + 15 \sin(2\pi \cdot 100 t)]$. Find the approximate bandwidth of the FM signal. (04 Marks)

OR

- 4 a. Describe the PLL working. (08 Marks)
- b. With the aid of neat circuit diagram balanced frequency discriminator. (08 Marks)
- c. What are the RF frequency range and intermediate frequency for AM and FM ratio? (04 Marks)

Module-3

- 5 a. Define Mean, correlation and covariance Functions of a random process $x(t)$. (08 Marks)
- b. Discuss Gaussian process and its properties. (08 Marks)
- c. Draw the characteristics of white noise. (04 Marks)

OR

- 6 a. Write the important properties of autocorrelation function. (08 Marks)
- b. Discuss shot noise, and thermal noise. (08 Marks)
- c. Define noise equivalent bandwidth. (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.

Module-4

- 7 a. Discuss noise in DSB-SC. Show that figure of merit for DSB-SC receiver is one. (10 Marks)
 b. Discuss pre-emphasis and de-emphasis in FM. (10 Marks)

OR

- 8 a. Derive the expression for figure of merit for FM. (14 Marks)
 b. Show that figure of merit for single tone AM modulation is equal to $1/3$ for 100% modulation. (06 Marks)

Module-5

- 9 a. With the aid of block diagram, describe PPM Generation and detection. (10 Marks)
 b. Design a PCM multiplexing system using 256 levels signal quantizer for the transmission of 3 signals: m_1 , m_2 and m_3 band limited to 5KHz, 10KHz and 5KHz respectively. Assuming that each signal is sampled at its Nyquist rate and 8 bits are transmitted simultaneously. Compute :
 i) Maximum bit duration
 ii) Channel Bandwidth required to pass PCM signal
 iii) The commutator speed in RPM. (10 Marks)

OR

- 10 a. Describe the basic elements of a PCM system. (10 Marks)
 b. State sampling theorem. Find the Nyquist sampling rate for the signal.
 $g(t) = 10 \cos(50\pi t) \cos^2(150\pi t)$ where t is in msec. (06 Marks)
 c. Represent the binary data given below in terms of i) unipolar NRZ signaling ii) Split phase. Binary data : 0 1 1 0 1 0 0 1. (04 Marks)

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