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Fifth Semester B.E. Degree Examination, June/July 2019
Analog Communication

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least TWO full questions from each part.

PART – A

1 a. If X and Y are the two random variables and are statistically independent. Prove that $P(X, Y) = P(X) P(Y)$. **(06 Marks)**
   b. Explain the following with necessary equations: i) Moments   ii) Joint Moments. **(10 Marks)**
   c. Explain central limit theorem. **(04 Marks)**

2 a. Draw the circuit diagram of square-law modulator. Explain and derive the expression for the output from the modulator. Draw the spectrum of the output of the modulator. **(08 Marks)**
   b. A 300W carrier is simultaneously modulated by two audio waves with percentage modulations of 50 and 60 respectively. What is the total sideband power? Obtain the transmission efficiency. **(04 Marks)**
   c. With a neat block diagram, explain the operation of Costas receiver. **(08 Marks)**

3 a. Explain with block diagram the operation of quadrature-carrier multiplexing system for both transmitter and receiver. **(08 Marks)**
   b. Describe the operation of phase discrimination method for generating SSB-SC signal for single stage. **(04 Marks)**
   c. With block diagram, necessary equations and spectrum explain the operation of synchronous detection of SSB-SC. **(08 Marks)**

4 a. Explain VSB. **(02 Marks)**
   b. Explain time domain description of VSB signal. Draw the block diagram of phase discrimination method for generating VSB signals. **(08 Marks)**
   c. Draw and explain the block diagram of frequency division multiplexing both transmitter and receiver. **(10 Marks)**

PART – B

5 a. For a single tone frequency modulation, derive the expression for modulated output. **(08 Marks)**
   b. A sinusoidal modulating voltage of amplitude 5V and frequency 1kHz is applied to a frequency modulator. The frequency sensitivity of modulator is 50Hz/Volt. The carrier frequency is 100kHz. Calculate: i) Frequency deviations ii) Modulation index. **(04 Marks)**
   c. Explain the block diagram of narrow band FM. For a single tone derive the expression for the output modulated wave. **(08 Marks)**

6 a. With a neat block diagram, explain the operation of FM demodulation using phase locked loop. **(10 Marks)**
   b. Explain with relevant block diagram FM stereo multiplexing. **(10 Marks)**

7 a. Explain the following terms:
   i)   Shot noise
   ii) Thermal noise
   iii) White noise
   iv) Noise figure.   (08 Marks)
   b. Derive the expression for noise figure and equivalent noise temperature for N number of two port networks connected in cascade.   (08 Marks)
   c. Two port devices are connected in cascade. For the first stage the noise figure and available power gain are 5dB and 12dB. For the second stage the noise figure and power gain are 15dB and 10dB. Determine overall noise figure in dB.   (04 Marks)

8 a. Derive the expression for noise figure for DSB-SC receiver.   (12 Marks)
   b. Explain functioning of preemphasis and de-emphasis in FM system.   (08 Marks)

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