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Fifth Semester B.E. Degree Examination, June/July 2015
Analog Communication

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer any FIVE full questions, selecting at least TWO questions from each part.
2. Missing data be suitably assumed.
3. Standard notations are used.
4. Draw neat diagrams, wherever necessary.

PART – A

1.
 - a. Define joint probability density function. Prove that the total volume under the surface represented by the joint PDF is always 1. (07 Marks)
 - b. State and prove central limit theorem. (07 Marks)
 - c. Find the CDF for an experiment of tossing a coin. The random variable maps head (H) with value 1 and tail (T) with value - 1. (06 Marks)
2.
 - a. Explain the generation of DSB-SC using ring modulator. (07 Marks)
 - b. Explain with block diagrams, quadrature carrier multiplexing and demultiplexing system. (07 Marks)
 - c. A 500W carrier is modulated on a depth of 70%, calculate the total power in the modulated wave in the following forms of AM.
 - i) Double sideband with full carrier.
 - ii) Double sideband suppressed carrier.
 - iii) Single sideband suppressed carrier. (06 Marks)
3.
 - a. Define Hilbert transform. Using Hilbert transform, derive the equation for SSB signals only with USB and rejecting the LSB. Explain with block diagram. (07 Marks)
 - b. With block diagram explain third method for generation of SSB modulated waves. (07 Marks)
 - c. $X(t) = A_c m(t) \cos 2 \pi f_c t$, obtain its pre-envelope and complex conjugate of pre-envelope. (06 Marks)
4.
 - a. Explain the method of envelope detection of a USB wave plus carrier. (06 Marks)
 - b. With the help of block diagram, explain the working of FDM system. (07 Marks)
 - c. Explain with a block diagram working of a superheterodyne receiver. Mention its advantages over TRF receiver. (07 Marks)

PART – B

5.
 - a. Derive the equation for FM waves. Define modulation index, maximum deviation and bandwidth of a FM signal. (07 Marks)
 - b. With the help of block diagram, explain the generation of narrowband FM using DSB-SC modulator. (07 Marks)
 - c. A carrier wave of amplitude 5V and frequency 90MHz is frequency modulated by a sinusoidal voltage of amplitude 5V and frequency 15kHz. The frequency deviation constant is 1 kHz/V. Sketch the spectrum of the modulated FM wave. Given $J_0 = 0.96$, $J_1 = 0.18$ and $J_2 = 0.02$. (06 Marks)



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- 6 a. Explain the working of a balanced slope detector. (07 Marks)
b. With a block diagram, explain the working of a FM stereo multiplexing. (07 Marks)
c. Explain the linear model of phase locked loop. (06 Marks)
- 7 a. Derive Friiss's formula for cascade connection of two post network. (07 Marks)
b. Define noise factor of a network. Show that by proving suitable equations that with the increase in noise factor the noise power at the output will also increases. (07 Marks)
c. If each stage has a gain of 10dB and noise figure of 10dB. Determine the overall noise figure of a two stage cascaded amplifier. (06 Marks)
- 8 a. Derive the equation for the figure of merit of an AM receiver operating on single tone AM. (07 Marks)
b. Derive the equation for the signal to noise ratio at the output of the DSB-SC receiver. (07 Marks)
c. Explain about pre-emphasis and de-emphasis in FM. (06 Marks)

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