

--	--	--	--	--	--	--	--	--	--

**Fifth Semester B.E. Degree Examination, December 2011**  
**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 autocorrelation function of the process  $X(t)$ . Explain the properties of autocorrelation function. (06 Marks)
  - b. Define Gaussian process. Explain the properties of Gaussian process. (06 Marks)
  - c. Let  $X$  be a continuous random variable having a uniform probability distribution defined in the range  $2 \leq x \leq 4$ . Let  $y = (3x + 2)$ . Find the means  $m_x$  and  $m_y$ . (08 Marks)
  
- 2
  - a. Explain with block diagram the coherent detection of conventional AM waves. Explain frequency error and phase error in this method. (08 Marks)
  - b. Explain with block diagrams, quadrature carries multiplexing and demultiplexing systems. (06 Marks)
  - c. An audio frequency signal  $(10 \sin 2\pi \times 500 t)$  volts is used to amplitude modulate a carrier of  $(50 \sin 2\pi \times 10^5)$  volts. Assume modulation index = 0.2. Find the following :
    - i) Sideband frequencies
    - ii) Amplitude of each side band frequencies
    - iii) B.W. required. (06 Marks)
  
- 3
  - a. Obtain time domain description of SSB – SC wave. (08 Marks)
  - b. Explain with block diagram a balanced modulator for the generation of DSB-SC. (06 Marks)
  - c. Define Hilbert transform. Obtain Hilbert transform of the following :
    - i)  $x(t) = (\cos 2\pi ft + \sin 2\pi ft)$
    - ii)  $x(t) = e^{-j2\pi ft}$ . (06 Marks)
  
- 4
  - a. What is frequency division multiplexing in (FDM)? Explain with a block diagram FDM system. (06 Marks)
  - b. Explain with a block diagram, superheterodyne receiver. Mention the merits of superheterodyne receiver over Tuned Radio Frequency receiver (TRF). (08 Marks)
  - c. Write a short note on vestigial side band modulation (USB). (06 Marks)

**PART – B**

- 5
  - a. With a neat block diagram, explain direct method of generating FM wave. Discuss how wide band FM (WBFM) can be generated using this method. (08 Marks)
  - b. Compare AM and FM systems. (06 Marks)

- c. A 93.2 MHz carrier is frequency modulated by a 5 kHz sine wave. The resultant FM signal has a frequency deviation of 40 kHz.
- Find the carrier swing of the FM signal.
  - What are the highest and lowest frequencies attained by the frequency modulated signal?
  - Calculate the modulation index for the wave. **(06 Marks)**
- 6 a. Explain with circuit diagram and necessary waveform, a FM slope detector. **(08 Marks)**  
b. Explain FM demodulation using PLL. **(08 Marks)**  
c. Write short notes on nonlinear effects in FM systems. **(04 Marks)**
- 7 a. What is a thermal noise? List the properties of thermal noise and briefly explain. **(06 Marks)**  
b. Define white noise. Plot Power Spectral Density (PSD) and Auto Correlation Function (ACF) of white noise. **(06 Marks)**  
c. An amplifier 1 has a noise figure of 9dB and power gain of 15 dB. It is connected in cascade to the other amplifier 2 with noise figure of 20 dB. Calculate the overall noise figure for this cascade connection. **(08 Marks)**
- 8 a. Obtain the figure of merit of noise in DSB – SC receiver. **(08 Marks)**  
b. Write short notes on :  
i) Pre-emphasis  
ii) De-emphasis  
iii) Amplitude limiters in FM system. **(12 Marks)**

\*\*\*\*\*