Paper Code: EC-609	**Roll No.**									

B. Tech.
(SEM VI) EVEN SEMESTER EXAMINATION 2015-16
COMMUNICATION ENGINEERING

[Time: 3 hrs.] **[Max. Marks: 100]**

Note- Attempt all questions. All Questions carry equal marks.

Q.1 Attempt any FOUR parts of the following: **[5x4=20]**

(a) What is amplitude modulation? Discuss the single tone sinusoidal modulation.

(b) What is the quadrature-carrier multiplexing?

(c) Discuss the Envelope detector method of demodulation of AM waves.

(d) A certain transmitter radiates 9kW with carrier un-modulated and 10.125kW when the carrier is modulated with sinusoidal signal. Find the following:

i. Calculate the modulation index.

ii. If another sine wave is simultaneously transmitted with index 0.4, determine the total radiated power.

(e) Calculate the percentage power saving when the carrier and one of the sidebands are in an AM wave modulated to a depth of (a) 100 percent (b) 50 percent.

(f) The antenna current of an AM broadcast transmitter, modulated to a depth of 40 percent by an audio sine wave, is 11A. It increases to 12A as a result of simultaneous modulation by another audio sine wave. What is the modulation index due to this second wave?

Q.2 Attempt any FOUR parts of the following: **[5x4=20]**

(a) Explain the working of balance frequency discriminator with help of circuit diagram.

(b) Discuss the FM modulation circuit using Varactor diode.

(c) Discuss the concept of instantaneous frequency in angle modulation.

(d) A sinusoidal carrier wave of 20volt, 20MHz is Frequency modulated by a sinusoidal message signal of 10volt, 25 kHz with frequency sensitivity 12.5 kHz per volt.

i. Find frequency deviation, modulation index, bandwidth and power.

ii. Find above parameter if message signal amplitude is double

(e) A carrier signal of frequency (f_c) is given to both AM and FM transmitter message signal frequency is given by 5 kHz. Maximum frequency deviation of FM is 2 times of bandwidth of AM , Find modulation index of both AM and FM such that strength of frequency component f_c+5 kHz is same in both AM and FM (Given that $J_1(2)=0.57$, $J_1(4)= 0.37$, $J_1(8)= 0.08$).

(f) What is the basic difference between AM and FM superhetrodyne receiver? A receiver is tuned to 750 KHz and IF =450 KHz, find (i) Image frequency (f_{si}) (ii) IRR if Q=50.

Q.3 Attempt any TWO parts of the following: **[10x2=20]**

(a) What is noise? What are various forms and sources of noise? Define SNR and noise figure of a receiver and also derive relation them.

(b) (i) What is the different type of errors in Delta modulator? How can these be removed?

(ii) A message signal of $10\cos 4\pi.10^3 t$ is transmitted through Delta modulator, whose pulse rate is 500per second, find output of Delta modulator?

(c) What is the need of quantization in PCM circuits? A message signal of $5\sin(4\pi x10^4 t)$ is transmitted through PCM system. Given that sampling rate is 5 times of Nyquist rate and maximum quantization error should be at most of 0.01% of peak amplitude of message signal. Find the Bandwidth of the PCM system.

Q.4 Attempt any TWO parts of the following: **[10x2=20]**

(a) Write short note on the following:
   i. Eye pattern
   ii. Inter symbol Interference(ISI)

(b) Describe the matched filter. What do you understand physical realisiblity of matched filter? Write properties of matched Filter.

(c) Explain with the help of diagram, a method of generating and demodulating phase shift keying signals.

Q.5 Attempt any TWO parts of the following: **[10x2=20]**

(a) Explain Orthogonal Frequency Division Multiplexing. Also draw its transmitter and Receiver.

(b) A discrete memory less source has Eight symbols x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8 with probabilities 1/4, 1/8, 1/16, 1/16,1/4,1/16,1/8. Construct a Shannon-fano code for the source and calculate code efficiency (ŋ). Take M=2.

(c) Giving modulated waveforms, signal space diagram and probability of bit errors. Draw its optimum receiver structures of DPSK and coherent FSK modulation schemes.