(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2118   **Roll No.** ☐☐☐☐☐☐☐☐☐☐☐

B. Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION
2010-11

PRINCIPLES OF COMMUNICATIONS

Time : 3 Hours   *Total Marks : 100*

Note :   (1) Attempt **all** questions.

         (2) Each question carries equal marks.

1. Attempt any **four** of the following :   **(5×4=20)**

     (a) With the help of block diagram explain the working of Communication System.

     (b) What is the need for modulation of signal before transmitting it to distant place ?

     (c) With the support of mathematical expressions explain the working of Balanced modulator.

     (d) How DSB-SC and DSD-C Demodulator works ? Explain.

     (e) What is the importance of Quadrature Amplitude Modulator ? Explain receiving system for Amplitude Modulated Signal.

     (f) The signal $v(t) = (1 + 0 \cdot 1 \cos w_1 t + 0 \cdot 1 \cos 2w_1 t) \cdot \cos w_c t$ is detected by a square-law detector, $v_o = 2v^2$.

2. Attempt any **four** of the following :   **(5×4=20)**

     (a) Relate phase and frequency Modulation. Show that phase Modulation is not linear.

(b) Consider an angle modulated signal :

$$x(t) = 3 \cos[2\pi \, 10^6 t + 2 \sin (2\pi \, 10^3 t)].$$

Find its instantaneous frequency at time $t = 0.5$ ms and maximum phase deviation.

(c) Derive Carson's rule. Discuss the effect of Modulation index β on Bandwidth in Tone Modulated FM signals.

(d) Illustrate the principle of Armstrong system of generating PM signal.

(e) With the help of Block diagram explain the working of FM demodulator.

(f) With relevant figure explain the working of stereophonic broadcasting transmitter receiver.

3. Attempt any **two** of the following : (10×2=20)

(a) What is sampling theorem ? What is the relevance of Discrete Fourier transform in relation to Nyquist criterion ?

(b) Discuss and compare pulse width Modulation and pulse position Modulation. Three signals m_1, m_2 and m_3 are to be multiplexed. m_1 and m_2 have a 50 kHz bandwidth and m_3 has a 10 kHz bandwidth. Design a commutator switching system so that each signal is sampled at its Nyquist rate.

(c) (i) Explain FDM and TDM. Discuss T1 Digital System.

(ii) Explain the working of PCM Communication System.

4. Attempt any **two** of the following : (10×2=20)

(a) With the help of Block diagram explain the working of Delta Modulation. How adaptive Delta Modulator improves the performance of Delta Modulator ?

(b) Discuss the classification, working advantages and one application of each type of vocoders.

(c) Gaussian noise n(t) of zero mean has a power spectral density :

$$G_n(f) = 2\mu V^2 / Hz \text{ for } |f| \leq kHz$$
$$= 0 \qquad \text{elsewhere.}$$

(i) What is the normalized power of noise ?

(ii) Write the probability density function f(n) of the noise.

(iii) The noise n(t) is passed through a filter. The power output of the filter is one-half the power of n(t). Write the probability density function for the output noise of the filter.

5. Attempt any **two** of the following : (10×2=20)

(a) Analyze Noises present in Analog Modulation System and derive its signal to Noise Ratio.

(b) What are various noises present in Frequency Modulation ? What is pre-emphasis and de-emphasis and how SNR improves ? Comment.

(c) Classify various types of Noises and represent them by their mathematical model. Explain the working of Digital Phase Locked loop.