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

PAPER ID : 2118 **Roll No.**

B.Tech.

(SEM. V) THEORY EXAMINATION 2011-12

PRINCIPLES OF COMMUNICATIONS

Time : 3 Hours *Total Marks : 100*

Note :— Attempt **all** the questions. Each question carries equal marks.

1. Attempt any **four** parts : (5×4=20)

   (a) Explain the working of square law Modulator for AM wave.

   (b) Draw the block diagram of phase shift method for generating the SSB signal and explain its working.

   (c) Explain the concept of heterodyning. What are the advantages of heterodyning ?

   (d) Discuss how the VSB Modulation is used in commercial TV signal. Discuss its merits and demerits.

   (e) Determine the image frequency for a standard broadcast band AM receiver using a 455 kHz IF and tuned to a station at 640 kHz.

   (f) Prove that the broadcast transmitter for AM, the maximum average power transmitted by an antenna is 1.5 times the carrier power.

2. Attempt any **four** parts : (5×4=20)

(a) Given the angle-modulated signal

$S_Q(t) = 10 \cos (2\pi 10^8 t + 200 \cos 2\pi 10^3 t)$. What is its bandwidth ?

(b) Derive an expression for a single tone frequency modulated wave.

(c) Explain the Armstrong method for the generation of wideband FM.

(d) Given an angle-modulated signal

$x_c(t) = 10 \cos [(10^8) \pi t + 5 \sin 2\pi (10^3)t]$.

Determine the maximum phase deviation and the maximum frequency deviation.

(e) In an FM system a 7 kHz modulating signal modulates 107.6 MHz carrier wave, so that the frequency deviation is 50 kHz. Determine :

(i) Carrier swing in the FM signal and modulation index.

(ii) The highest and lowest frequency attained by the FM signal.

(f) Explain the Foster-Seeley Discriminator Method.

3. Attempt any **two** parts : (10×2=20)

(a) Define the sampling process and explain its necessity in the communication systems. Also compare PAM, PWM and PPM systems.

(b) For the binary sequence 011010110 construct NRZ, RZ, AMI and Manchester format.

(c) Write notes on TDM, PCM hierarchy from T_1 to T_4.

4. Attempt any **two** parts : (10×2=20)

(a) The output signal to quantizing noise ratio $(SNR)_0$ in a PCM system is defined as the ratio of average signal power to average quantizing noise power. For a full scale sinusoidal modulating signal with amplitude A, prove that

$$(SNR)_0 = \left(\frac{S}{N_q}\right)_0 = \frac{3L^2}{2}$$

where L is the number of quantizing levels.

(b) Derive an expression for signal to quantization noise power ratio for delta modulation. Assume that no slope overload distortion exists.

(c) ASCII has characters that are binary-coded, if a computer generates 100000 characters per second, determine :

(i) The number of bits required per character.

(ii) The data rate or bit rate are required to transmit the computer output.

5. Attempt any **two** parts : (10×2=20)

(a) Determine the overall noise figure of a three stage cascaded amplifier, each stage having a power gain of 10dB, and noise figure of 6 dB.

(b) What do you mean by figure of merit ? Why it is necessary to employ pre-emphasis and de-emphasis in FM system ?

(c) What is digital Phase Locked Loop ? Explain the working of an EX-OR Gate based digital phase comparator.