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

PAPER ID : 2724   **Roll No.**

B.Tech.

(SEM. VII) ODD SEMESTER THEORY
EXAMINATION 2012-13

DIGITAL COMMUNICATION

Time : 3 Hours   *Total Marks : 100*

Note :– Attempt **all** questions. All questions carry equal marks.

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

   (a) With the help of block diagram, explain the working of digital communication system. Calculate the capacity of a Gaussian channel with a bandwidth of 1MHz and S/N ratio of 20 db.

   (b) Show that the entropy is maximum when all the symbols are equiprobable. An event has six possible outcomes with probabilities $P_1 = 1/2$, $P_2 = 1/4$, $P_3 = 1/8$, $P_4 = 1/16$, $P_5 = 1/32$. Find the entropy of the system, also find the rate of information if there are 16 outcomes per second.

   (c) State and explain the source coding theorem. A discrete memory-less source has five symbols x_1, x_2, x_3, x_4 and x_5 with probabilities $P(x_1) = 0.4$, $P(x_2) = 0.19$, $P(x_3) = 0.16$, $P(x_4) = 0.15$ and $P(x_5) = 0.1$. Design the shanno-fano code and calculate the code efficiency.

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

(a) Describe delta modulation systems. What are its limitations ? How can they be overcome ? Explain the importance of Companding technique.

(b) Enlist the properties of line coding ? Give that the bit sequence gives below is to be transmitted.bit sequence = 1 0 1 1 0 0 1 0. Draw the resulting waveform, if the sequence is transmitted using : (i) Polar RZ (ii) AMI.

(c) What is Matched Filter ? Derive an expression for impulse response of the matched filter.

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

(a) What is the Nyquist criterion of Zero ISI ? Discuss the role of equalizer.

(b) Draw the block diagram of QPSK system and explain its working. Compare the bandwidth of QPSK system with that of BPSK system.

(c) Explain frequency shift keying. Describe coherent detection of FSK signals. What should be the relationship between bit-rate and frequency shift for a better performance ?

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

(a) (i) The spectral range of a bandpass signal extends from 10.0 MHz to 10.04 MHz. Find the minimum sampling rate.

(ii) What are the advantages of TDM over FDM ? Explain synchronous and asynchronous time division multiplexing of PCM signals.

(b) What do you understand by T-1 carrier system ? Describe PCM hierarchy.

(c) Explain the gram-schmidt orthogonalization procedure.

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

(a) Compare the noise performance of different digital modulation schemes.

(b) Define linear block codes. Consider a (7, 4) block code is generated by generator matrix G,

$$
\mathbf{G} = \begin{bmatrix} 1 & 0 & 0 & 0 : & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 : & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 : & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 : & 1 & 1 & 1 \end{bmatrix}
$$

Find all the code words and explain how the error syndrome S helps in correcting a single error.

(c) Write short notes on (i) Cyclic codes (ii) Trellis Diagram.