Subject: DIGITAL COMMUNICATIONS

Time: 3 Hours **Max. Marks: 100**

JUNE 2011

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Is it true that Quantizing noise can be reduced by increasing the number of samples per second?

(A) Yes **(B)** No
(C) not necessarily **(D)** None of these

b. Which of the following is restriction imposed on the reconstruction of a sampled signal?

(A) Impulses must be passed through a high pass filter.
(B) Impulses must be passed through a bandpass filter.
(C) The sampling rate must be in the form of impulses.
(D) None of these.

c. Which multiplexing technique transmits analog signal

(A) FDM. **(B)** TDM.
(C) WDM. **(D)** Both **(A)** and **(B)**.

d. The Nyquist sampling rate for a signal band limited to 4 kHz is

(A) 4 kHz **(B)** 8 kHz
(C) 2 kHz **(D)** 16 kHz

e. In the eye-pattern, as eye closes,

(A) ISI increases. **(B)** ISI decreases.
(C) Timing jitter increases. **(D)** Timing jitter decreases.

f. If the carrier which is modulated by a digital bit stream had one of the possible phases 0°, 90°, 180° and 270°, then modulation is called

(A) BPSK **(B)** QPSK
(C) QAM **(D)** MSK

g. A source generates 4 messages, then the entropy of the source will be maximum when

(A) all probabilities equal.
(B) one of the probabilities equal 1 and 2, others are zero.
(C) the probabilities are $1/2$, $1/4$ and $1/2$.
(D) the two of the probabilities are $1/2$ each and other is zero.

h. If the PN sequence generated at the modulator is used in conjunction with the PSK modulation to shift the phase of the PSK signal, Pseudo randomly at a rate that is an integer multiple of the bit rate, then the resulting modulated signal is called.

(A) FH spread spectrum signal **(B)** DS spread spectrum signal
(C) Random phase PSK signal. **(D)** Random phase FSK signal.

i. Multilevel codes are used to

(A) increase the efficiency of bandwidth utilization by allowing a reduction in required bandwidth for a given data rate.
(B) recover the clock pulse required for synchronization.
(C) increase noise immunity.
(D) increase the signal-to-quantization noise ratio.

j. The signal constellation of M-ary PSK for M>4 is

(A) Circular. **(B)** Rectangular.
(C) Elliptical. **(D)** A Line.

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. A discrete source emits one of the five symbols once every millisecond with probabilities1/2, 1/4,1/8, 1/16 and 1/32 respectively. Determine the (i) source entropy and (ii) information rate. **(8)**

b. What is entropy coding and describe Huffman encoding briefly. **(8)**

Q.3 a. Using block diagram, describe briefly the concept of Time Division Multiplexing. **(8)**

b. State Sampling theorem and explain the importance of Nyquist rate and Nyquist interval in digital communication. **(8)**

Q.4 a. Explain the quantization error and derive an expression for maximum signal to noise ratio in PCM system with linear quantizer. **(8)**

b. With the help of neat diagram, explain the transmitter and receiver of Pulse Code Modulation. **(8)**

Q.5 a. Explain NRZ polar & NRZ Bipolar format. **(8)**

b. What is Inter symbol interference? Explain its effects and methods to reduce it. **(8)**

Q.6 a. Draw the block diagram of QPSK system and explain its working. **(8)**

b. Explain the concept of carrier synchronization in QPSK. **(8)**

Q.7 a. What is matched filter and derive an expression for the impulse response of a matched filter? **(8)**

b. Explain Gram-Schmidt orthogonalization. **(8)**

Q.8 a. What do you mean by PN sequence and explain with a suitable diagram, how are they generated using feedback shift register? **(8)**

b. What do you mean by Frequency Hop Spread Spectrum? Describe slow frequency hopping. **(8)**

Q.9 a. Discuss various types of jammer waveforms. **(8)**

b. Write short note on any **TWO** of the following:-

(i) Applications of spread spectrum modulation
(ii) Digital Radio
(iii) Lightwave Transmissions. **(8)**