

Subject: DIGITAL COMMUNICATIONS

Time: 3 Hours

JUNE 2011

Max. Marks: 100

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
- (A) all probabilities equal.
 - (B) one of the probabilities equal 1 and 2, others are zero.
 - (C) the probabilities are $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{2}$.
 - (D) the two of the probabilities are $\frac{1}{2}$ 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 probabilities $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$ and $\frac{1}{32}$ 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.
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)