ROLL NO. _____

Code: AE67 Subject: DIGITAL COMMUNICATION

AMIETE – ET

Time: 3 Hours **JUNE 2013** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

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. Aperture effect occurs in communication due to:

(A) Sampling at less than Nyquist rate
(B) Flat top sampling
(C) Finite bandwidth of transmission channel
(D) Short duration of samples

b. Which of the following require a synchronizing signal?

(A) PPM **(B)** PAM
(C) PDM **(D)** All of these

c. A communication channel with AWGN has a bandwidth of 4 KHz and a SNR of 15. Its channel capacity is:

(A) 1.6 kbps **(B)** 16 kbps
(C) 32 kbps **(D)** 456 kbps

d. Processing gain (G_P) of a spread spectrum system is the rate of:

(A) $2\ T_b/T_c$ **(B)** $2\ T_c/T_b$
(C) $T_b/2T_c$ **(D)** T_b/T_c

e. Comparison of MSK and QPSK scheme shows that:

(A) MSK requires less power **(B)** QPSK requires less power
(C) Filtering is simple in MSK **(D)** No comparison

f. The length of PN sequence for a 8 stage feedback shift register is:

(A) 127 **(B)** 256
(C) 255 **(D)** 128

g. For M>4, the signal constellation of M-ary PSK is:

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

h. In the eye pattern, as eye closes:

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

i. Which encoding method uses alternative positive and negative values for 1s:

(A) NRZ **(B)** RZ
(C) Manchester **(D)** AMI

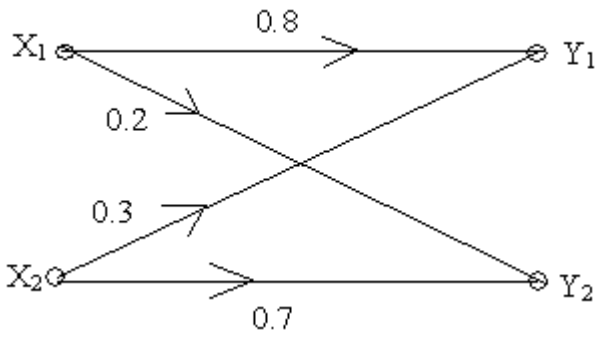
j. The PDF of envelope of narrow band noise is:

(A) Uniform **(B)** Gaussian
(C) Very large **(D)** Coherent detector

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

Q.2 a. What is entropy? Show that the entropy is maximum when all the messages are equi-probable. **(8)**

b. Find the mutual information and channel capacity of the channel shown in figure below. Given $p(x_1) = 0.6$ and $p(x_2) = 0.4$ **(8)**



Q.3 a. State and prove the sampling theorem. **(8)**

b. Explain with neat sketch generation of in – phase and quadrative samples from band pass signal g(t). **(8)**

Q.4 a. What is QPSK? Discuss a correlation receiver (for QPSK) with the help of block diagram. What is bit probability error for QPSK. **(8)**

b. Explain Intersymbol Interference (ISI). Write down the causes of ISI? **(8)**

Q.5 a. Explain the differential PCM with the help of block diagrams. **(8)**

b. What do you mean by matched filter in digital communications and calculate the probability of error for matched filter? **(8)**

Q.6 a. Explain the quantization error and derive an expression for maximum signal to noise ratio in PCM system that uses linear quantization. **(8)**

b. Discuss the methods of implementing adaptive equalizers. **(8)**

Q.7 a. Represent 1100110 in

(i) Polar NRZ (ii) Unipolar NRZ
(iii) AMI (iv) Manchester **(8)**

b. Explain the applications of spread-spectrum techniques. **(8)**

Q.8 a. Draw block diagram of pseudorandom sequence generator and explain its working. **(8)**

b. What is DSSS? Explain the transmitter and receiver of DSSS. **(8)**

Q.9 Write short notes on any **TWO**:

(i) Application of digital – modulation technique
(ii) Differential phase shift keying
(iii) Maximum – likelihood detector **(8+8)**