

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)**

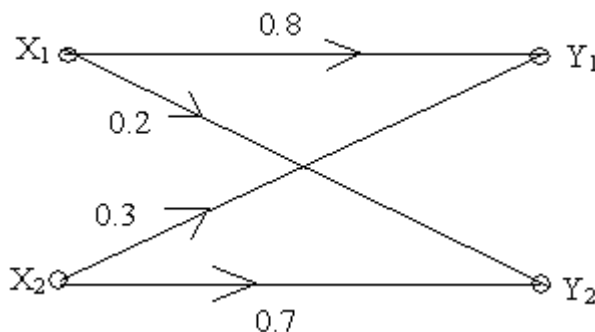
- a. Aperture effect occurs in communication due to:
- (A) Sampling at less than Nyquist rate
  - (B) Flat top sampling
  - (C) Finite bandwidth of transmission channel
  - (D) Short duration of samples
- b. Which of the following require a synchronizing signal?
- (A) PPM
  - (B) PAM
  - (C) PDM
  - (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

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- 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 quadrature 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)