AMIETE - ET (OLD SCHEME)

Code: AE21	Subj	ject: DIGITAL COMMUNICATIONS
Fime: 3 Hours	DECEMBER 2009	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.
- 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: ((2x1)	ιU
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- a. Which of the following requires a synchronizing signal?
 - (A) single channel PPM system
- **(B)** PAM

(C) PDM

- **(D)** all of the above
- b. In delta modulation, which of the following drawbacks are existing?
 - 1. Slope overload
- 2. Serration noise
- 3. Granular noise

(A) 1 and 2 only

(B) 2 and 3 only

(C) 1 and 3 only

- **(D)** 1,2 and 3
- c. In an PCM the amplitude levels are transmitted in a 7 unit code. The sampling is done at the rate of 10 Hz. The bandwidth should be
- (A) 5 kHz

(B) 5 MHz

(C) 70 kHz

- **(D)** 35 kHz
- d. The purpose of source coding is to
 - (A) Increase the information Transmission rate
 - **(B)** Decrease the information Transmission rate
 - (C) Decrease the S/N ratio
 - **(D)** Decrease the probability of error
 - e. If carrier modulated digital bit stream had one of the possible phases of 0, 90, 180 and 270 degrees, then the modulation scheme used is
 - (A) BPSK

(B) QPSK

(C) QAM

- **(D)** MSK
- f. Aperture effect in the reconstructed signal from samples is due to loss of
 - (A) High frequency components
- (B) midrange frequency components
- **(C)** low frequency components
- **(D)** None of these
- g. Which of the following gives the minimum probability of error

0.2

- AMIETE ET (OLD SCHEME) (A) ASK (B) FSK (C) DPSK (D) PSK h. A DSSS signal is designed so that P_R/P_N at the intended receiver is 10^{-2} . If the desired E_b/N_0 is 10 for acceptable performance, determine the minimum value of processing gain. (A) 20 **(B)** 1000 **(C)** 100 **(D)** 50 The generator matrix for a (7, 4) linear block code is given by: $\begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$ Then the code word for the message vector[1 0 1 1] will be **(A)** 1011001 **(B)** 1000110 **(C)** 1010101 **(D)** 1010111 In a matched filter probability of error depends on (A) signal wave shape **(B)** signal energy (C) Both A and B **(D)** None of these
 - Answer any FIVE Questions out of EIGHT Questions. Each question carries 16 marks.
- b. Derive an expression for signal to quantization noise ratio for a PCM system which employs linear quantization technique. Given that input to the PCM system is a sinusoidal signal (8)
- Q.3 a. Draw and explain the block diagram of Adaptive Delta Modulation. (9)

a. State and prove Sampling Theorem used for the reconstruction of original signal.

- b. A delta modulation system is designed to operate at 3 times the Nyquist rate for a signal with a 3kHz bandwidth. The quantizing step size is 250mV. (7)
 - (i) Determine the maximum amplitude of a 1kHz input sinusoid for which the delta modulator does not show slope overload distortion.

(8)

- (ii) Determine the post filtered output signal to quantizing noise ratio for the signal of part (i).
- Q.4 a. Prove that the output signal of a matched filter is proportional to a shifted version of the auto correlation function of the input signal to which the filter is matched.(6)
 - b. Explain the effect of Inter Symbol Interference in base band transmission. How ISI can be reduced? (10)
- Q.5 a. Explain the detection of BPSK modulated signal. (8)
 - b. Describe error performance analysis for QPSK, MSK and DPSK signal. (8)
- Q.6 a. Explain the necessity of syndrome decoding. Also calculate the syndrome vector. (8)

- b. For a (n, k) linear block code which corrects single error per code vector, prove that, $n \ge k + \log_2(n+1)$ and hence design a linear block code with a minimum distance of three and a message block size of eight bits. (8)
- Q.7 a. Explain the Viterbi algorithm for decoding of convolutional codes.
 b. The generator polynomial of a (7,4) cyclic code is G(p)=p³+p+1. Find all the code vector for the code in systematic form.
 (8)
- Q.8 a. Explain the operation of FHSS system with block diagram. Also mention the limitations of DS-SS and FH-SS systems. (12)
 - b. Determine the processing gain and Jamming margin in a DS-SS system. Given $T_b = 4.095 m \sec$, $T_c = 1 \mu \sec$. Assume a maximum of P_e is less then equal to 10^{-5} . Also, calculate the number of feedback stages required. (4)
- Q.9 a. With the help of example, explain the DPSK modulation technique of digital transmission. (8)
 - b. Explain PN sequence. Also, describe three randomness properties which makes it to be appear as random. (8)