

Total No. of Questions : 8]

SEAT No. :

**P3502**

[Total No. of Pages : 3

**[5560]-151**  
**T.E. (E & TC)**  
**DIGITAL COMMUNICATION (Semester - I)**  
**(2012 Pattern)**

*Time : 2½ Hours]*

*[Max. Marks :70*

*Instructions to the candidates:*

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1)** a) Explain need of companding with mathematical expressions and characteristics, explain A - Law and  $\mu$  - Law companding. [8]
- b) What is bit synchronization? Explain closed loop bit synchronizer. [6]
- c) A voltage  $v(t)$  which is a Gaussian Ergodic Random process with a zero mean and a variance of 4 volt<sup>2</sup>, is measured by a dc meter, True RMS meter and a meter which First squares  $v(t)$  and then reads its dc component. Find the output of each meter. [6]

OR

- Q2)** a) State limitations of Delta Modulator. Explain ADM transmitter and receiver with neat block schematic. [8]
- b) Explain T1 - carrier system and AT & T multiplexing hierarchy. [6]
- c) Determine autocorrelation Function and power spectral density of output process when random process  $x(t)$  is applied to a LTI system. [6]
- Q3)** a) Find decision threshold if conditional probability density functions after addition of noise are of Gaussian distribution and voltage  $v_1$  represents symbols  $S_1$  and  $v_2$  symbol  $S_2$  for noise case. Show the threshold when apriori probabilities are equal and unipolar signal  $V_1 = +v$  and  $V_2 = 0$  [8]

*P.T.O.*

- b) Derive the expression for the probability of error of integrate and dump filter. [8]

OR

- Q4)** a) Explain following decision rules. [8]

- i) Likelihood Ratio Test
- ii) Minimum error Test

- b) Explain Geometric Representation of signal with neat diagram of synthesizer and Analyzer for generating the set of signal vectors. [8]

- Q5)** a) In a digital communication system the bit rate of NRZ data stream is LMbps and carrier frequency is 100 MHz

Find i) The symbol rate of transmission.

ii) Bandwidth requirement of the channel and

iii) Mathematical Expression in the following cases

1) BPSK    2) QPSK    3) 16 - ary PSK    [9]

- b) What is coherent detection? Draw the block diagram of QPSK receiver and explain its operation with proper mathematical expression. [9]

OR

- Q6)** a) Derive error probability expression of BPSK modulation system [9]

- b) Compare ASK, PSK and FSK modulation techniques. [9]

- Q7)** a) A pseudo-noise (PN) sequence is generated using a feedback shift register of length  $m = 4$ . The chip rate is  $10^7$  chips per second. Find the following

Parameter : i) PM sequence length.

ii) Chip duration of the PN sequence.

iii) PM sequence period [8]

- b) Give the difference between [8]
- i) Slow FHSS and Fast FHSS
  - ii) TDMA and CDMA

OR

**Q8) a)** A DSSS system has the following properties:

Information bit duration  $T_b = 5 \text{ ms}$

PM chip duration  $T_c = 0.5 \mu\text{s}$  and  $\frac{E_b}{N_0} = 10$ .

Find processing gain, what is the jamming margin? What is the number of shift registers required? [8]

**Q8) b)** Write a short note on [8]

- i) Wireless telephone Systems.
- ii) Personal communication Systems.

