



[4658] – 562

Seat No.	
-------------	--

**T.E. (E&TC) (Semester – I) Examination, 2014**  
**DIGITAL COMMUNICATION**  
**(2012 Pattern)**

Time : 3 Hours

Max. Marks : 70

**Instructions :** 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.

1. a) Explain the flat-top sampling with functional diagram. Draw spectral diagram for the flat-top sampled signal and aperture effect. 8
- b) With the help of neat schematic, explain early-late synchronizer. 6
- c) A voltage  $V(t)$  which is a Gaussian Ergodic Random process with a mean of zero and a variance of 4 volt<sup>2</sup>, is measured by a dc meter, a 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

2. a) Explain with neat schematic and mathematical analysis, a transmitter and receiver for DPCM. 8
- b) Derive the expression for power spectral density of polar NRZ signal. 6
- c) Define Random process. Explain various time averages associated with the random process. 6
3. a) Derive the expression of SNR for integrator and dump filter and explain working of integrator and dump filter. 8
- b) Explain Gram-Schmit procedure for orthogonalization. 8

OR

4. a) Derive the expression of probability error ( $P_e$ ) for matched filter. 8
- b) 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.



5. a) In a digital communication system, the bit rate of NRZ data stream is 5Mbps and carrier frequency of transmission is  $100 \text{ MHz}$ . Find. 9
- Mathematical equation
  - Symbol rate
  - Band width
- for the following modulation schemes.
- BPSK
  - QPSK
  - 16-ary PSK.
- b) Draw the block diagram of DPSK transmitter and explain its operation with proper waveforms. 6
- c) Explain the concept of OFDM. 3

OR

6. a) Given the input binary sequence 1100100010, sketch the waveforms of the in-phase and quadrature components of a modulated wave obtained by using the QPSK scheme. 9
- b) Compare BPSK, QPSK and M'ary PSK with the help of equations, signal space representation, symbol rate and bandwidth. 9
7. a) A spread spectrum system has the following parameters. 6
- Information bit duration  $T_b = 4.095 \text{ m sec.}$
- PN chip duration  $T_c = 1 \mu \text{ sec.}$
- Find the processing gain. What is the number of shift registers required ? Also find the jamming margin if the  $\frac{E_b}{N_o} = 10$  for the BPSK scheme.
- b) Draw block diagram of DSSS- PSK transmitter. 2
- c) What are the properties of maximal length sequences ? Give the graphical representation of auto correlation property of random data and a PN sequence and explain. 8

OR

8. a) Draw and explain FHSS spread spectrum system with transmitter and receiver section. 8
- b) Explain various wireless standards for Wi-Fi and Wi Max. 4
- c) Write short note on Personal Communication Systems (PCS). 4