DipIETE – ET

Time: 3 Hours   **DECEMBER 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. Which of the following is the application of spread-spectrum technique?

(**A**) Digital Multiplexers   (**B**) CDMA
(**C**) T1 System   (**D**) M12 Multiplexer

b. In each periods of a maximum- length sequence, the number of 1s more than the number of 0s, this property of maximum- length sequence is called the _____

(**A**) Run property   (**B**) Balance property
(**C**) Correlation property   (**D**) Symmetric property

c. We can convert an analog signal into digital signal by combining three basic operations. These three basic operations are

(**A**) Multiplexing, modulating, transmitting,
(**B**) Scanning, switching, multiplexing
(**C**) Sampling, quantizing and encoding
(**D**) Comparing, de-multiplexing and scanning.

d. _____ is a measure of the average information content per source symbol.

(**A**) Information   (**B**) Uncertainty
(**C**) Prefix Coding   (**D**) Entropy

e. Quantizing noise occurs in

(**A**) PCM   (**B**) TDM
(**C**) PAM   (**D**) CDMA

f. In which of the following format, a positive pulse is transmitted for symbol 1, and a negative pulse is transmitted for symbol 0.

(**A**) NRZ   (**B**) RZ
(**C**) Polar   (**D**) Non Polar

g. For each symbol 1 and 0 in PSK phase of carrier differs by _____ degree.

(A) 45   **(B)** 90
(C) 180   **(D)** 360

h. A non-coherent matched filter is the combination of matched filter and

(A) Envelope detector   **(B)** Phase detector
(C) Frequency detector   **(D)** Integrator

i. For the uniform sampling of band-pass signal, in quadrature sampling scheme represents a natural extension of the sampling of_____

(A) High pass signals   **(B)** Low pass signals
(C) All pass signal   **(D)** Digital signals

j. Delta modulation is _____ version of Differential PCM.

(A) Single   **(B)** One bit or Two- level
(C) Three - level   **(D)** Four-level

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

Q.2   a. Discuss the channel characteristics importances in digital-communication.
                                                                          (8)

   b. A discrete memory less source has an alphabet of five symbols with probabilities 0.4, 0.2, 0.2, 0.1, 0.1 respectively. Compute Huffman code for this source, the average code word length and entropy of this code.   **(8)**

Q.3   a. Explain the principle of quadrature sampling of band - pass signal.   **(4)**

   b. Explain TDM in brief with the help of block diagram.   **(4)**

   c. Explain practical aspect of sampling in detail.   **(8)**

Q.4   a. Explain Robust quantization. Also explain μ- law and A – law companding. **(8)**

   b. The ramp signal $x(t) = at$ is applied to a delta modulator that operates with a sampling period T_S and step size $\Delta = 2\delta$.
   (i) Show that slope-overload distortion occurs if $\delta < aT_{S,}$.
   (ii) Sketch the modulator output for the following three values of step size.
      ▪ $\delta = 0.75\ aT_S$
      ▪ $\delta = aT_S$
      ▪ $\delta = 1.25aT_S$ **(8)**

Q.5 a. Explain in detail the Nyquist criterion for distortion less base band binary transmission. What are its practical limitation and solution of these limitations?   **(8)**

b. Construct NRZ bipolar format for the binary sequence 011010110.   **(4)**

c. Explain base band M- ary PAM system in brief.   **(4)**

Q.6 a. With the help of neat sketch explain coherent binary PSK transmitter and receiver.   **(8)**

b. List the coherent modulation techniques.   **(4)**

c. Give comparison of binary and quaternary modulation techniques in brief. **(4)**

Q.7 a. Explain Gram-Schmidt Orthogonalization procedure with the help of block diagram and mathematical analysis.   **(8)**

b. Explain the properties of matched filter.   **(8)**

Q.8 a. Explain the frequency hopped spread spectrum with the help of suitable block diagram.   **(8)**

b. A 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 parameters. **(8)**

1) PN sequence length.
2) Chip duration of the PN sequence.
3) PN sequence period.

Q.9   Write Short note on any **TWO** of the following:

(i) T1 System.

(ii) Applications of digital modulation techniques.

(iii) Applications of spread spectrum techniques.

(2×8)