ROLL NO. _____

Code: DE63 **Subject: DIGITAL COMMUNICATIONS**

DipIETE – ET (Current Scheme)

Time: 3 Hours **DECEMBER 2015** **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. A signal is having a highest frequency component F. The minimum Nyquist rate to recover this signal is

(A) 2F **(B)** 1F
(C) 3F **(D)** 4F

b. PCM is an example of _____ encoding.

(A) Digital-to-digital **(B)** Digital-to-analog
(C) Analog-to–analog **(D)** Analog-to-digital

c. Which encoding method uses alternating positive and negative values for 1's?

(A) NRZ-I **(B)** RZ
(C) Manchester **(D)** AMI

d. A pulse modulation technique as the width of a constant amplitude pulse is varied proportional to the amplitude of the analog signal at the time the signal is sampled.

(A) Pulse Width Modulation **(B)** Pulse Length Modulation
(C) Pulse Duration Modulation **(D)** All of these

e. In delta modulation, the modulator is sometimes called _____.

(A) Continuous ADC **(B)** tracking ADC
(C) Variable slope ADC **(D)** slope ADC

f. The type of modulation most often used with direct-sequence spread spectrum is

(A) QAM **(B)** SSB
(C) FSK **(D)** PSK

g. A source generates 4 messages, then the entropy of the source will be maximum when

(A) All probabilities are equal.
(B) One of the probabilities equal 1 and 2, others are zero.
(C) The probabilities are 2/1, 4/1 and 2/ 1.
(D) The two of the probabilities are 1/2 each and other is zero.

h. Determine the channel capacity of a 4 kHz channel with S/N = 10 dB.

(A) 8.02 kbps **(B)** 4.17 kbps
(C) 13.74 kbps **(D)** 26.58 kbps

i. It is a process of converting an infinite number of possibilities to a finite number of conditions.

(A) Sampling **(B)** Coding
(C) Quantization **(D)** Aliasing

j. The modulation technique used in the GSM is

(A) QPSK **(B)** MSK
(C) GMSK **(D)** ASK

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

Q.2 a. Draw the block diagram of digital communication system and explain the function of each block. **(8)**

b. A message source generates one of four messages randomly every microsecond. The probabilities of these messages are 0.5, 0.4, 0.3 and 0.1. Each emitted message is independent of other messages in the sequence: **(4)**
(i) What is the source entropy?
(ii) What is the rate of information generated by this source in bits per second?

c. Derive an expression for channel capacity of a discrete memory less channel. **(4)**

Q.3 a. State and prove sampling theorem for low pass signal and band pass signals. **(8)**

b. Draw Block diagram of PAM-TDM (pulse amplitude modulation-time division multiplexing) and explain the process in detail. **(8)**

Q.4 a. Explain Delta Modulation (DM) in detail with the help of neat block diagram. Also discuss its advantages and disadvantages. **(8)**

b. A PCM signal uses a uniform Quantizer followed by a 7 bit binary encoder. The bit rate of the system is equal to 100 X 10^6 bits/second.
(i) What is the maximum message bandwidth for which system operates satisfactory?
(ii) Calculate the output signal to quantization noise ratio when the full load sinusoidal modulating wave of frequency 2 MHz is applied to the input. **(8)**

Q.5 a. Explain Inter symbol interference. **(8)**

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

c. Explain generalized form of Correlative Coding. **(4)**

Q.6 a. Draw and Explain block diagram of QPSK transmitter and receiver. **(8)**

b. Explain the concept of carrier synchronization in PSK. **(8)**

Q.7 a. Explain Gram-Schmidt orthogonalization procedure. **(8)**

b. Explain properties of Matched filters. **(8)**

Q.8 a. Define Frequency Hop Spread Spectrum. Describe slow frequency hopping. **(8)**

b. Explain Direct Sequence Spread Coherent Binary Phase Shift Keying system with the help of neat transmitter and receiver block diagrams. **(8)**

Q.9 Write short notes on any **TWO** of the following:- **(8×2)**
(i) Digital Multiplexers
(ii) Digital Radio
(iii) Code Division Multiple Access.