ROLL NO. _____

Code: AE67 Subject: DIGITAL COMMUNICATIONS

AMIETE – ET

Time: 3 Hours **JUNE 2014** **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. Entropy is a measure of

(A) Total information content per source symbol
(B) Average information content per source symbol
(C) Total probability of occurrence of an event
(D) Average probability per source symbol

b. $\delta(t - nT_s)$ is a Dirac delta function located at time

(A) $t = 0$ **(B)** $t = T_s$

(C) $t = nT_s$ **(D)** $t = t - nT_s$

c. In the use of PCM for the digitization of a voice or video signal, the signal is sampled at a rate slightly higher than the Nyquist rate. The resulting sampled signal is then found to exhibit

(A) high correlation between adjacent signal
(B) low correlation between adjacent signal
(C) No correlation between adjacent signal
(D) Rapid change in signal from one sample to next

d. The advantage of Non–Return to zero Bipolar format over return to zero Bipolar format is:

(A) Saving in power **(B)** Synchronization is easier
(C) Synchronization is lost **(D)** Saving in Bandwidth

e. A pair of sinusoidal waves that differ only in a relative phase-shift of 180° are called as

(A) Out of phase signals **(B)** Antipodal signals
(C) Reversible signals **(D)** Correlated signals

f. A property of matched filter describes that the spectrum of output signal of a matched filter with the matched signal as input except for a time delay factor is proportional to

(A) Power spectral density of I/P signal
(B) Energy spectral density of I/P signal
(C) Sample function of I/P signal
(D) Integrated version of I/P signal

g. Spread spectrum is a means of transmission in which data of interest occupies a bandwidth _____ the minimum bandwidth necessary to send the data

(A) in excess of **(B)** equal to
(C) less than **(D)** comparable to the

h. A shortcoming of M - ary PSK and DPSK schemes is their susceptibility to _____ experienced in telephone channels.

(A) Quantum Noise **(B)** Phase Jitter
(C) Scattering **(D)** Adaptive equalization

i. In a digital Radio, some anomalous propagation conditions arising from natural phenomena, cause the transmitted signal to propagate along several paths cach of different electrical length. This phenomenon is called

(A) Frequency hopping **(B)** Amplitude hopping
(C) Bio Diversity **(D)** Multipath fading

j. The method used when all users are permitted to transmit simultaneously and also occupy the same RF bandwidth of the satellite channel, is

(A) TDMA **(B)** FDMA
(C) CDMA **(D)** QPSK

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

Q.2 a. Consider a discrete memory less source with given data. Generate a Huffman code for the same. Also show that the minimum variance Huffman code is obtained by moving the probability of a combined symbol as high as possible.

Symbol	S_0	S_1	S_2	S_3	S_4
Probability	0.4	0.2	0.2	0.1	0.1

(12)

b. Give any two properties of mutual information. **(4)**

Q.3 a. Explain the following terms: **(8)**
(i) Nyquist Rate (ii) Aliasing error
(iii) Quadrature Sampling (iv) Signal to Distortion Ratio

b. Explain the sample and hold circuit for signal recovery. **(8)**

Q.4 a. The information in an analog signal voltage waveform is to be transmitted over a PCM system with an accuracy ± 0.1% (full scale). The analog voltage waveform has a band width of 100Hz and an amplitude range of – 10 to + 10 volts. Find the step size, No of quantization levels, minimum sampling frequency and number of bits in each PCM word. **(10)**

b. Explain Delta modulation. **(6)**

Q.5 a. Explain the Nyquist criterion for distortionless baseband transmission in the absence of noise which provides a method for constructing bad limited function to overcome the effects of inter symbol interference. **(10)**

b. What is Eye Pattern and how does it help to study inter symbol interference? **(6)**

Q.6 a. Draw the block diagrams of a DPSK transmitter and receiver. State various advantages & disadvantages of this system of digital modulation format. **(8)**

b. A binary ASK system for equally probable messages uses 100 μsec. bits and channel has $N_o = 1.338 \times 10^{-5}$ W/Hz. Determine the peak transmitted pulse amplitude to maintain $P_e \le 2.055 \times 10^{-5}$.

Given if $\text{erf}_c \sqrt{\frac{E_b}{2N_0}} \le 2 \times 2.055 \times 10^{-5}$

Then $\sqrt{\frac{E_b}{2N_0}} \le 2.9$ **(8)**

Q.7 a. Draw detector and vector receiver diagram and explain. **(8)**

b. Explain the matched filter recover. **(8)**

Q.8 a. A spread spectrum communication system has the following parameters
Information bit duration, $T_b = 4.095$ ms
PN chip duration, $T_c = 1\mu s$.
Find the processing gain, required P N sequence, feedback shift length.
If $\frac{E_b}{N_0} = 10$, find jamming margin. **(8)**

b. Explain the difference between slow frequency Hopping and fast frequency Hopping. **(8)**

Q.9 Write short notes on:

(i) Digital Communication by Satellite
(ii) Light Wave Transmission **(8+8)**