Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (EIE-N)/SEM-6/EC-601 (EI)/2010

2010

DIGITAL COMMUNICATION SYSTEM

Time Allotted : 3 Hours | Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) The frequency spectrum of a square wave or a rectangular wave in time domain is

a) Impulse function b) Sinc function

c) Sine function d) Gaussian function.

ii) Nyquist rate of a composite signal

$x(t) = 5 \cos 2000\pi t \cos 3000\pi t$ is

a) 3000 Hz b) 2000 Hz

c) 4000 Hz d) 1000 Hz.

iii) Companding in PCM is used

a) to overcome quantizing noise

b) to minimize amplitude in receiver

c) to eliminate distortion in high amplitude

d) none of these.

iv) To avoid slope overload in delta modulation, the maximum value of signal amplitude will be

a) sf_s b) w/s

c) sf_s/w d) f_s/w.

where s is step size, f_s is sampling frequency and w is signal frequency.

v) In 30 Channels PCM channel, bit rate is

a) 2·033 Mbps b) 2·048 Mbps

c) 2·162 Mbps d) 2·248 Mbps.

vi) What is the value of quantization error ?

a) $\Delta^2/2$ b) $\Delta^2/12$

c) $\Delta^3/12$ d) $\Delta/2$.

vii) For generation of FSK the data pattern must be given in

a) RZ format

b) NRZ format

c) Split-phase Manchester

d) FSK.

viii) In QPSK, the transmission bandwidth (BW) is required

a) f_b b) $2f_b$

c) $f_b/2$ d) $4f_b$.

Where f_b is bit rate.

ix) ADM involves additional hardware designed to provide variable step size

a) reducing slope over load effect

b) reducing granular noise

c) reducing quantization noise

d) none of these.

x) Consider a code C = { 01011, 11111 }, what will be the Hamming distance ?

a) 3 b) 2

c) 5 d) 0.

xi) Output of the Matched Filter with rectangular input pulse is

a) Rectangular b) Triangular

c) Impulse d) Sinusoidal.

xii) Companding is used

a) to protect small signals in PCM from quantizing distortion

b) to overcome quantized noise in PCM

c) to overcome impulse noise

d) to overcome white noise.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) Sketch the binary ASK wavefrom for the bit sequence 11101101001.

b) What is the difference between MSK and QPSK ? 2 + 3

3. Explain how regenerative repeater can be used to regenerate the original data, state with proper block diagram.

4. a) What is matched filter ?

   b) Find the transfer function of optimum filter. 1 + 4

5. What are the desirable properties of line code ? Given the data stream 1110010100. Sketch the transmitted sequence of rectangular pulses for each of the following line codes :

   i) Polar RZ

   ii) Bipolar NRZ

   iii) Manchester. 2 + 3

6. Explain the implication of "Intersymbol Interference" in digital communication.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Explain with suitable block diagram how an analog signal is converted into a digital signal using PCM. 5

   b) Derive an expression of signal to quantization noise ratio for a PCM system. 5

   c) A binary PCM system uses a uniform quantizer and 8-bit binary encoder. If the bit rate is 100 Mb/s, what is the maximum bandwidth for which the system will operate satisfactorily ? Determine the output signal-to-quantization noise ratio when full load sinusoidal modulating wave of frequency 1 MHz is applied to the input. 5

8. a) What do you mean by coherent and non-coherent reception ? 3

b) Draw the block diagram of QPSK transmitter and receiver with proper explanation. 7

c) Mention the advantages of the QPSK modulation technique. 2

d) What do you mean by "Eye pattern" ? 3

9. a) Explain DPSK process. 4

b) What are the disadvantages of BPSK and how is it removed ? 4

c) Describe orthogonal BFSK. 4

d) Give the comparison in between ASK, PSK & FSK. 3

10. a) Draw and explain block diagram of transmitters and receiver of DPCM. 7

b) What are the advantages of adaptive delta modulation ? 3

c) The pulse rate in a DM system is 56,000 per sec. The i/p signal is $5 \cos (2\pi\ 1000t) + 2 \cos (2\pi\ 2000t)$ V, with t in sec. Find the minimum value of step size which will avoid slope overload distortion. What would be the disadvantages of choosing a value of larger than the minimum ? 5

11. Write short notes on any *three* of the following : 3 × 5

a) CDMA

b) Equaliser

c) Regenerative repeater

d) Eye pattern

e) Nyquist criterion for zero ISI.