MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC-601

DIGITAL COMMUNICATION

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) What are the disadvantages of digital communication ?

   a) Needs more bandwidth

   b) Is more complex

   c) Both (a) and (b)

   d) None of these.

   ii) The characteristics of compressor in μ-law companding are

   a) continuous in nature

   b) logarithmic in nature

   c) linear in nature

   d) discrete in nature.

[Turn over

iii) Which of the following modulation is digital in nature ?

a) PAM b) PPM
c) PCM d) DM.

iv) One of the disadvantages of PCM is

a) it requires large bandwidth
b) very high noise
c) cannot be decoded easily
d) all of these.

v) Flat-top sampling leads to

a) an aperture effect b) aliasing
c) loss of the sign d) none of these.

vi) Which is the most commonly used line coding format with best overall desirable properties ?

a) P-NRZ b) P-RZ
c) BP-AMI-RZ d) UP-RZ.

vii) Regenerative repeaters are used for

a) eliminating noise
b) reconstruction of signals
c) transmission over long distances
d) all of these.

viii) The advantage of using Manchester format of coding is

a) power saving
b) polarity sense at the receiver
c) noise immunity
d) none of these.

ix) What is the probability of drawing two clubs from a well shuffled pack of 52 cards ?

a) 13/51 b) 2/52
c) 1/26 d) 1/17.

x) If the baud rate of QPSK is 400 the bit rate is

a) 100 b) 400
c) 800 d) 1600.

xi) In coherent detection of signals

a) local carrier is generated synchronized with modulated carrier

b) local carrier is generated with random phase

c) all of these

d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. Write the advantages and disadvantages of digital communication system over analog communication system.
3. For the data bit 10110001, draw the waveforms for ASK, FSK, PSK and QPSK.
4. What is companding ? State A-law and μ-law.
5. Explain in brief the properties of line coding.
6. What is quantization error ? How does it depend upon the step size ? Suggest some methods to overcome the difficulties encountered when the modulating signal amplitude swing is very large. 1 + 2 + 2

GROUP – C

(Long Answer Type Questions)

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

7. a) Draw the block diagram for generation and detection of the BPSK signal and explain its operation clearly. 3 + 3

b) List the advantages and disadvantages of DPSK modulation technique. 4

c) A binary data stream 10111000 is to be transmitted using DPSK. Show that the reconstruction of the signal by the DPSK technique is independent of the choice of the extra bit. 5

8. a) Explain the principle of PCM system with neat diagram. Derive the expression in dB for signal to noise ratio of PCM system. 4 + 5

   b) A PCM system uses a uniform quantizer followed by a 7-bit binary encoder. The bit rate of the system is equal to 50 kbps.
      i) What is the maximum message signal bandwidth for which the system operates satisfactorily ?
      ii) Calculate the output signal to quantization noise ratio when a full-load sinusoidal modulating wave of 1-MHz frequency is applied to the input. 6

9. a) What is Nyquist criterion for Inter-symbol interference ? 5

   b) How is eye diagram useful to detect the effect of ISI ? 4

   c) Write down sampling theorem. Discuss different methods of sampling. 2 + 4

10. a) Explain the function of equalizer and bit-synchronizer in regenerative repeaters. 6

    b) Draw the block diagram of an early late bit synchronizer. 4

    c) Design a 3-tap zero forcing equalizer for a distorted received pulse $p(t)$, where

t	$-3T_b$	$-2T_b$	$-T_b$	0	T_b	$2T_b$	$3T_b$
$p(t)$	0	0	0·1	1	–0·2	0·1	0

    Draw the equalized pulse. 5

11. Write short notes on any *three* of the following : 3 × 5
    a) Regenerative repeater
    b) MSK
    c) Properties of line coding
    d) Adaptive Delta Modulation
    e) Zero forcing equalizer.