Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(ICE)/SEM-5/IC-505/2009-10

2009

DATA COMMUNICATION & TELEMETRY

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) For generation of PAM signal we have to use

      a) sample and hold circuit

      b) weinbridge oscillator circuit

      c) smith trigger circuit

      d) integrator circuit.

   ii) The bandwidth of FM is

      a) less than

      b) equal to

      c) greater than

      d) less than equal to

      the bandwidth of AM.

iii) The figure of merit for a satellite transmitter is

a) G/T ratio b) C/N ratio

c) EIRPd) none of these.

iv) The telemetry system used as wireless telemetry system is

a) Voltage telemetry system

b) Current telemetry system

c) Frequency telemetry system

d) none of these.

v) In voltage telemetry system the preferred Singal to Noise ratio is

a) < 0·5 b) > 0·5 & < 1·0

c) > 1·0 & < 2·0 d) > 2·0.

vi) At the receiving side of FDM/FM/FM system, the filter used is

a) LPF b) BPF

c) Band reject filter d) none of these.

vii) Theoretically the bandwidth required in FM is

a) Zero b) Unity

c) 10 d) Infinite.

viii) Band pass filter is require at the receiver side for demultiplexing in which system

a) TDM

b) FDM

c) Both FDM and TDM

d) Neither FDM nor TDM.

ix) The signal to quantization noise ratio in an N-bits PCM system

a) Depends upon the sampling frequency employed

b) Indepedent of the value of N

c) Increases with increasing the value of N

d) Decreases with increasing the value of N.

x) Time Division Multiplexing is preferred because

a) it require less power

b) it needs lesser bandwidth

c) more than one massage can be transmitted simultaneously over a common channel

d) none of these.

xi) Which one of the following is not advantage of TDM over FDM ?

a) TDM has simpler instrumentation

b) TDM is not vulnerable in the usual source of the FDM inter-channel cross-talk

c) TDM can achieve minimum bandwidth over FDM without loss of cross-talk immunity.

xii) In a Go-Back-N ARQ, if the range of sequence number is 0 to 63, then what will be the window size ?

a) 65 b) 63

c) 64 d) 6.

xiii) In HDLC ..... field defines the beginning and end of a frame.

a) flag b) address

c) control d) FCS.

xiv) A 56 K modem can download at a rate of ..... Kbps and upload at a rate of ..... Kbps.

a) 33·6 ; 33·6 b) 33·6 ; 56·6

c) 56·6 ; 33·6 d) 56·6 ; 56·6.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \infty 5 = 15$

2. a) Define modulation. 2

b) Why do we need modulation ? 3

3. a) Define the term telemetry. 2

b) Draw and explain the general block diagram of a telemetry system. 3

4. a) What is the main disadvantage of SSB signal generation using selective filtering methods ?

b) Why are voice signals suitable for SSB signal generation using selective filtering methods ?

c) Draw the block diagram how SSB signal generate using phase shift methods. $1\frac{1}{2} + 1\frac{1}{2} + 2$

5. a) Show that output singal-to-quantization noise ratio $(\text{SNR})_0$ in a PCM system is

$$(\text{SNR})_0 = \left(\frac{S}{Nq}\right) = \frac{3}{2} L^2 \text{ or } \left(\frac{S}{Nq}\right)_{dB} = 1{\cdot}76 + 20 \log L$$

where L is the number of quantization level.

b) In binary PCM system, the output signal-to-quantization noise ratio is to be held to minimum of 40dB. Determine the number of quantization levels and find the output signal-to-quantization noise ratio. 3 + 2

6. What is the difference between serial and parallel transmission ? What is the difference between simplex, duplex and half-duplex systems ? 2 + 3

7. Discuss about the major components of Telephone Network. What is the difference between Inter-and Intra-Local Access Transport Areas ? 2 + 3

GROUP – C
(Long Answer Type Questions)

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

8. a) Show that the power of single tone AM signal will be

$P_t = P_c [1 + 1/2 \, m_a^2]$. 3

b) A 500 watts carrier is modulated to a depth of 80 per cent. Find the total power in the amplitude modulated wave. Assume the modulating singal to be a sinusoidal one. 3

c) Show that the current of a single tone AM signal will be $I_t = I_c \left[1 + 1/2\, m_a^2 \right]$. 3

d) Describe how High Level AM take place. 3

e) The antenna current of an AM transmitter is 10A, if only the carrier is sent, but it increases to 9·25A, if the carrier is modulated by a single sinusoidal wave. Determine the percentage modulation. Also find the antenna current if the percent of modulation changes to 0·7. 3

9. a) Draw the block schematic diagram of TDM/PCM/FM system of telemetering and make appropriate labels, both on the transmitting and receiving sides. What is a time frame in the system ? 8

b) Discuss about clock recovery cricuit. 5

c) Why is synchronization necessary in all TDM systems ? 2

10. a) What is the main advantages of DPCM over PCM ?

b) What are the main limitations in delta modulation ?

c) How can slope overload error be reduced by adaptive delta modulation (ADM) ? Describe with necessary diagram.

d) A signal of bandwidth f_m = 3·5 kHz is transmitted using a binary companded PCM with μ = 150. Find out the transmission bandwidth and output signal-to-quantization noise ratio $(SNR)_0$. 2 + 3 + 7 + 3

11. a) Define LAN, MAN and WAN. 3

b) What are the parameters for choosing a good transmission media ? 2

c) Explain the construction of twisted pair cable. What is the difference between UTP and STP ? 2 + 3

d) Explain the construction of coaxial cable. What is the difference between thick and thin coaxial cable ? 2 + 3

12. a) What are three popular ARQ mechanisms ? 1

b) How does ARQ correct an error ? 3

c) Discuss about the sender and receiver sliding windows in Go-Back-N ARQ technique. 6

d) The antenna current of an AM transmitter is 8 amps when only carries is sent, but it increases to 8·96 amps when the carrier is modulated by a single tone sinusoid.

i) Find modulation index

ii) Find the antenna current when the depth of modulation changes to 0·8 amps. 5

13. Write short notes any *three* of the following : 3 ∞ 5

a) Modem

b) Asynchronous and synchronous data transfer modes

c) Narrow band FM

d) Delta modulation

e) Phase-locked loop

f) Sample and hold circuit.