TELECOMMUNICATION SYSTEMS AND ENGINEERING
(ECEN 5231)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.*

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

    (i)   The loudness loss between an electric interface in the network and the listening subscriber's ear is called
    (a) RLR   (b) CLR
    (c) SLR   (d) OLR.

    (ii)   The links that run between the switching systems are called
    (a) Trunks   (b) Subscriber lines
    (c) Switching Lines   (d) None of these.

    (iii)   A voice frequency repeater used on a subscriber loop is
    (a) an audio amplifier   (b) a fllter
    (c) an oscillator   (d) none of this.

    (iv)   ATM cell consists of
    (a) 50 octets   (b) 54 octets
    (c) 53 octets   (d) 55 octets.

    (v)   To calculate the dc loop resistance for subscriber loop the formula applicable is
    (a) $R_{dc} = 1.1095/d^2$ (b) $R_{dc} = 0.1095/d^2$
    (c) $R_{dc} = 0.1095/d$ (d) None of these.

    (vi)   In DS1 signal format the one bit which is added as a framing bit is called
    (a) S bit   (b) P bit
    (c) Supervisory bit   (d) None of this.

    (vii)   Degradation of system error performance by displacement of ideal sampling instant is caused by
    (a) Jitter   (b) Distortion
    (c) Thermal noise   (d) Echo.

(viii) SONET provide digital formats extending to
(a) 2000.00 M bits/sec
(b) 9953.28 M bits/sec
(c) 5309.28 M bits /sec
(d) 2099.99 M bits/sec.

(ix) An STS-1 signal which includes various overhead bytes and envelope capacity is a specific sequence of
(a) 800 bytes
(b) 850 bytes
(c) 810 bytes
(d) 820 bytes.

(x) The basic rate access in ISDN is defined as
(a) 2B +D
(b) 2B +2D
(c) B + 2D
(d) 2B – D.

Group- B

2. (a) Compare in-band and out-of-band supervisory signalling.
[(CO1)(Analyze/IOCQ)]
(b) Distinguish between GOS and blocking probability with proper descriptions.
[(CO1)(Analyze/IOCQ)]
(c) A group of 40 servers carry a traffic of 20 erlangs. If the duration of a call is 6 minutes, calculate the number of calls put through by a single server and the group as a whole in a one-hour period. *[(CO1)(Evaluate/HOCQ)]*
4 + 5 + 3 = 12

3. (a) In a group of 20 servers, each is occupied for 40 minutes in an observation interval of two hours. Calculate the traffic carried by the group.
[(CO1)(Evaluate/HOCQ)]
(b) Explain E and M signalling. *[(CO1)(Understand/IOCQ)]*
(c) "Hierarchial switching networks are capable of handling heavy traffic". Justify the statement. *[(CO1)(Analyze/IOCQ)]*
3 + 4 + 5 = 12

Group – C

4. (a) Distinguish between space division switching with time division switching.
[(CO2)(Analyze/IOCQ)]
(b) "Bit synchronization is necessary in case of PCM transmission". Justify the statement. *[(CO2)(Analyze/IOCQ)]*
(c) Discuss the various transmission impairments of PCM system.
[(CO2)(Remember/HOCQ)]
4 + 3 + 5 = 12

5. (a) Define SONET? Explain briefly the three overhead levels of SONET and their functions. *[(CO2)(Remember/LOCQ)]*
(b) Explain the importance of digital network synchronization? How it is achieved in European E1 system? How do slips affect speech and data communication?
[(CO2)(Understand/LOCQ)]
(2 + 4) + (2 + 2 + 2) = 12

Group - D

6. (a) Design the LAN architecture related to OSI as per 802.11 standard with necessary block diagram. *[(CO4)(Create/HOCQ)]*
   (b) Distinguish between bus and ring topologies of LAN. *[(CO3)(Analyze/IOCQ)]*
   (c) Differentiate LAN routers with LAN switches. *[(CO3)(Analyze/IOCQ)]*

   4 + 6 + 2 = 12

7. (a) CSMA/CP is sometime called "listen while transmitting" – Justify.
   [(CO3)(Analyze/IOCQ)]
   (b) Mention the factors, which determine the basic topologies of LAN.
   [(CO3)(Remember/LOCQ)]
   (c) Explain:
   (i) Collision detection in CSMA/CD
   (ii) Latency with respect to the token ring LAN. *[(CO4)(Analyze/IOCQ)]*

   3 + 3 + 6 = 12

Group – E

8. (a) Distinguish between Basic Rate access and Primary Rate Access of ISDN architecture. *(CO5)(Analyse/IOCQ)]*
   (b) Mentions the different functions of the lower three layer of ISDN.
   [(CO5)(Understand/LOCQ]

   6 + 6 = 12

9. (a) Draw the basic structure of an ATM cell. *[(CO6)(Remember/LOCQ)]*
   (b) Briefly describe the functions of ATM Adaption Layer. *[(CO6)(Understand/LOCQ)]*
   (c) Explain briefly Retrieval and Conversational services in B-ISDN.
   [(CO6)(Understand/LOCQ)]

   2 + 4 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	34.37	50	15.63

Course Outcome (CO):

The students, after completing the course, will be able to:
1. Define and describe the different telephone networks, ADSL etc.
2. Recognize digital telephone systems, SONET and SDH and Digital Network Synchronization.
3. Compare local area networks- features and parameters.
4. Explain the various 802.11 standards and their applications.
5. Analyze ISDN and its operation.
6. Explain ATM networks and operations and B-ISDN.

LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.