

**TELECOMMUNICATION SYSTEMS
(ECEN 3131)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one 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) 1 Erlang means the telecommunication circuit line is occupied for
(a) 1 hour (b) 1 second (c) 1 minute (d) 1/60 second.
- (ii) The ratio of number of successful calls to the number of call attempts is known as
(a) Call Completion Rate (b) Call Block Rate
(c) Busy Hour Call Rate (d) None of the above.
- (iii) If 'n' number of users is present in a network with point-to-point links, then how many links will be required in the network?
(a) $n(n - 1)$ (b) $n(n - 1)/2$
(c) $n(n - 1)/4$ (d) $n(n - 1)/8$.
- (iv) In a space division switch, if $N = 200$, the number of cross points
(a) greater than 40,000 (b) less than 40,000
(c) 40,000 (d) greater than 100,000.
- (v) A fully connected network has 8 nodes. So numbers of physical link required
(a) 24 (b) 18 (c) 28 (d) 36.
- (vi) The part of the telephone network between the telephone instrument at subscriber premises and the central office equipment is called the
(a) Inter Office Trunk (b) Tie line
(c) Subscriber Loop (d) Service Drop wire.
- (vii) The Basic rate access of ISDN is
(a) $2B + D$ (b) $3B + D$ (c) $B + 2D$ (d) $2B + 2D$.
- (viii) The inter digit time is
(a) 400 ms (b) 500 ms (c) 200 ms (d) 300 ms.
- (ix) When a control system is an integral part of the switching network, then it is called
(a) direct control (b) stored program control
(c) common control (d) distributed control.

- (x) STD stands for
(a) State Trunk Dialling
(c) Subscriber Terminal Dialling
- (b) Subscriber Trunk Destination
(d) Subscriber Trunk Dialling.

Group- B

2. (a) Explain with necessary diagram operation of a rotary dial telephone. [[CO2](Understand/LOCQ)]
(b) How a switching system reduces number of connecting links among the subscribers in a telecommunication system? [[CO2](Analyse/IOCQ)]
(c) Clarify the reasons, why the space division switches are not used in digital exchanges. [[CO2](Understand/LOCQ)]
4 + 4 + 4 = 12
3. (a) What is DTMF technology? [[CO2](Remember/LOCQ)]
(b) Virtual circuit service is better than datagram service: Justify the statement. [[CO2](Analyse/IOCQ)]
(c) Design an appropriate combination of both time and space division switches which will be advantageous (reduction of cross points in switch) in a telecommunication system. [[CO1,CO2](Evaluate/HOCQ)]
3 + 3 + 6 = 12

Group - C

4. (a) Mention the advantages and disadvantages of Satellite communication. [[CO3](Remember/LOCQ)]
(b) "Modern cables use optical fibre technology to carry digital data, which includes telephone, Internet and private data traffic": What may be the possible reasons behind this application? [[CO1,CO3](Analyse/IOCQ)]
(c) Compare common channel and in-channel signalling technique. [[CO1,CO3](Analyse/IOCQ)]
4 + 4 + 4 = 12
5. (a) How routing decision is taken in the hierarchical system of routing? Explain with diagram. [[CO3](Understand/LOCQ)]
(b) Design a higher order multiplexor to accommodate 4032 number of subscribers using 30 channel TDM frame. [[CO1,CO3](Evaluate/HOCQ)]
(c) What are the three forms of signalling technique used in a telecommunication network? [[CO3](Remember/LOCQ)]
4 + 6 + 2 = 12

Group - D

6. (a) How digital spread spectrum technology improved the performance of Cordless telephone? [[CO4](Analysis/IOCQ)]
(b) What are the fundamental channels used in ISDN structure? Mention some basic characteristics of these channels? [[CO5](Remember/LOCQ)]

- (c) Why distance is a limitation for DSL and not a limitation for voice telephone calls?
[[CO4](Analysis/IOCQ)]
4 + 4 + 4 = 12

7. (a) With ISDN one can transmit large amounts of data, voice, and video signals over a single telephone line, at higher speeds-and lower cost-than any analog modem: Justify the statement. [[CO5](Analysis/IOCQ)]
(b) VoIP can't replace traditional phone system: justify the statement. [[CO1,CO4](Analysis/IOCQ)]
(c) Compare the next generation network with traditional telecommunication network. [[CO5](Understand/LOCQ)]
4 + 4 + 4 = 12

Group - E

8. (a) Explain the loss system and delay system for voice network and data network. [[CO4](Remember/LOCQ)]
(b) During a busy hour, 1400 calls were offered to a group of trunks and 14 calls were lost. The average call duration has 3 minutes. Find (i) Traffic offered (ii) Traffic carried (iii) GOS and (iv) The total duration of period of congestion. [[CO6](Evaluation/HOCQ)]
4 + 8 = 12
9. (a) Illustrate the GOS in traffic engineering. [[CO6](Remember/LOCQ)]
(b) During 20 minutes 40 subscribers initiate calls with a total duration of 4800 seconds. Calculate load offered and average subscriber traffic. [[CO2](Understand/LOCQ)]
(c) Outline with necessary state transition diagram for the Birth and Death process in telecommunication. [[CO6](Analyze/IOCQ)]
3 + 4 + 5 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	41.67	37.5	20.83

Course Outcome (CO):

After the completion of the course students will be able to

1. Apply the previous knowledge of analog communication to appreciate the contents of this paper.
2. Understand basics of Telecommunications and its entities along with the evolution of different types of exchanges.
3. Identify concepts of Telecommunication like signaling techniques, setting up linksetc effectively.

4. Describe working principles and practical applications of FAX, EPABX, EFT, Email, ISDN etc effectively.
5. List salient features of EWSD, NGN, ADSL etc.
6. Evaluate performance of a telecom network using the concepts of Traffic Engineering and case studies based on the observation.

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