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) Which of the following mode is suitable for propagation of a signal having frequency between 2 MHz and 30 MHz?
(a) Ground Wave (b) Sky Wave
(c) LOS (d) OFC.

(ii) To send a data packet using datagram, connecting path will be established
(a) before data transmission (b) not before data transmission
(c) no connection is required (d) None of the above.

(iii) The unit of traffic intensity is
(a) Ampere (b) Ohm (c) Erlang (d) Meter.

(iv) MTTR stands for
(a) Mean time to repair (b) Maximum time to repair
(c) Minimum time to repair (d) More time to repair.

(v) Main benefit of light wave communication over any other communication media is
(a) lower cost (b) better security
(c) wider bandwidth (d) freedom from interference.

(vi) Which multiplexing technique involves signals composed of the light beams?
(a) FDM (b) TDM (c) WDM (d) none of the above.

(vii) Maximum signalling rate allowed in Rs-232C is
(a) 19.3 Kbps (b) 19.4 Kbps
(c) 19.2 Kbps (d) 19.6 Kbps.

(viii) 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.

(ix) 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.

(x) In message switching system, an incoming message gets ____ especially if the required route is busy.
(a) lost (b) stored in a queue & retransmitted
(c) sampled (d) recovered.

Group – B

2. (a) How a switching system reduces number of connecting links among the subscribers in a telecommunication system? [(CO2) (Analyse/IOCQ)]
(b) What were the disadvantages of a manual exchange employing telephone operator? [(CO2) (Understand/LOCQ)]
(c) If Subscriber A wants to make a call to subscriber B, what are the basic signalling functions need to be generated by the exchange initially to indicate the condition of the subscribers? [(CO2)(Apply/IOCQ)]

4 + 4 + 4 = 12

3. (a) Evaluate and find the loop resistance limit for the minimum current requirement of 25mA for a carbon microphone set where, 48 Volt battery supply with a series resistance of 400 ohm is extended from the exchange. Consider the telephone set resistance is 50 ohm. [(CO1) (Analyze/IOCQ)]
(b) Clarify the reasons, why the space division switches are not used in digital exchanges. [(CO2)(Understand/LOCQ)]
(c) Analyze and differentiate the working function of circuit switching and packet switching. [(CO2)(Analyse/IOCQ)]

3 + 3 + (3 + 3) = 12

Group – C

4. (a) "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)]
(b) Why hybrid circuit is needed in Subscriber loop systems? [(CO3)(Remember/LOCQ)]
(c) Let an exchange uses unigauge design in subscriber loop. One remote subscriber needs to be connected to this exchange. But the length of the subscriber loop exceeds the attenuation and signalling limit for that subscriber. How the exchange will connect this subscriber through subscriber loop without compromising with the quality. Elaborate with necessary block diagram. [(CO3)(Evaluate/HOCQ)]

4 + 4 + 4 = 12

5. (a) Differentiate between Common Channel and In-Channel signalling technique. [(CO3)(Analyze/IOCQ)]

(b) Design and estimate the total number of final selectors required for an exchange with 1000-line and the number range 000-299 is allotted to business subscribers. 40% of these subscribers in each group of 100 are active during peak hours. The number range 300-999 is allotted to domestic connections. Ten per cent of the domestic subscribers are active in each group at any time. [(CO2)(Evaluate/HOCQ)]

(c) Differentiate analyzes the performance of data transmission through graded index fibres and step index fibres. [(CO3)(Analyze/IOCQ)]

4 + 5 + 3 = 12

Group – D

6. (a) Draw the system architecture of the EWSD Digital Switching System. [(CO5) (Remember/LOCQ)]

(b) What are the functional differences between Data Terminal Equipment (DTE) and Data Communications (or channel) Equipment (DCE)? [(CO4)(Analysis/IOCQ)]

(c) How DSL connection provide internet access through the telephone line? [(CO1)(Analysis/IOCQ)]

4 + 4 + 4 = 12

7. (a) Outline the attributes of VoIP telephony in modern telecommunication system. [(CO5) (Analyzer/IOCQ)]

(b) B-ISDN can overcome the drawbacks of ISDN line – Critically evalute the statement with necessary architecture. [(CO4) (Evaluate/HOCQ)]

(c) How you can coordinate the Next Generation Network with a smart system network in telecommunication. [(CO5)(Create/HOCQ)]

3 + 5 + 4 = 12

Group – E

8. (a) Prove that GoS = PB (Blocking Probability). [(CO6)(Apply/IOCQ)]

(b) A public call office (PCO) is installed in a busy part of a town. 150 persons use the booth every day. The average holding time for a call is 1.5 minutes. There is a suggestion from the public that another PCO is required in the same locality as the wait times are unduly long. Use M/M/1 queue. Does the suggestion deserve serious consideration? [(CO6) (Evaluate/HOCQ)]

6 + 6 = 12

9. (a) An augmentation is to be done a rural exchange where normally experiences four call originations per minutes. During designing of switching system different parameters are to be considered. Check and derive the probability, that exactly eight calls occur in an arbitrarily chosen interval of 30 seconds. [(CO6)(Evaluate/HOCQ)]

(b) Outline with necessary state transition diagram for the Birth and Death process in telecommunication. [(CO6) (Analyze/IOCQ)]

5 + 7 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	28%	40%	32%

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

Department & Section	Submission Link
ECE_I	https://classroom.google.com/u/0/w/NDA1MTY2MTA1Mjk2/tc/NDYzODUzMDQxMDcy
ECE_II	https://classroom.google.com/w/NDA2MTI0ODM4OTU1/tc/NDYzOTM2NTg3NDMw
Backlog	https://classroom.google.com/c/NDY0Mjc5ODkyMjE2?cjc=3cnpvo5