

B.E. ELECTRONICS AND TELE-COMMUNICATION ENGINEERING
THIRD YEAR SECOND SEMESTER EXAM 2025
DIGITAL SWITCHING AND COMPUTER NETWORKS (HONS.)

Time: Three Hours

Full Marks: 100

Answer Question No. 1 and any FIVE questions from the rest. Q.1 carries 20 marks and the rest are of 16 marks each. Answer in brief with proper justification. All the symbols used carry the standard meanings.

1.	Answer with proper reasons. Attempt all the parts in one place. Section I: Select with reasons the correct option: (2 × 5 = 10) i. If one use either Telnet or FTP, which is the highest layer he is using to transmit data? a) Application, b) Session, c) Presentation, d) Transport ii. For a ____ channel, we need to use the Shannon capacity to find the maximum bit rate. a) noiseless, b) noisy, c) low-pass, d) bandpass iii. ____ is a type of transmission impairment in which an outside source such as crosstalk corrupts a signal. a) Noise, b) Distortion, c) Attenuation, d) Decibel iv. In a ____ topology, if there are n devices in a network, each device has (n – 1) ports for cable. a) Bus, b) Mesh, c) Ring, d) Star v. Traffic Capacity is given by a) Switching capacity × Theoretical maximum load b) Switching capacity / Theoretical maximum load c) Theoretical maximum load / switching capacity d) Theoretical maximum load × Switching capacity Section II: Answer in brief. (2 × 5 = 10) vi. Why the standard of an OSI model is termed as 802.xx? vii. What do you mean by encapsulation in network design strategy. viii. Comment on the signaling technique used in SS7 protocol. ix. Why is UDP referred as “fire and forget” protocol? x. What do we mean by GOS of 2%?	20
2.	(a) Classify the basic Communication Switching System with reference to the development from early days to the modern times. (b) Irrespective of the system what are the basic requirements of a switching office and accordingly highlight the basic functions of such a switching system. (c) With a sketch substantiate the Distributed and the Centralized model of a switching system.	3 + 7 + 6
3.	(a) What are the different static and transient impairments while transmission of voice or data in a channel? (b) Draw a block diagram to represent the path for echo and hence provide mathematical expressions for Trans-hybrid Loss and Balanced Return Loss. (a) An exchange uses 48 V battery, a resistance of 300 Ω is placed in series with the battery. If the telephone set resistance is 50 Ω, calculate the loop resistance limit for the minimum current requirement of 23 mA for carbon microphone.	4 + 9 + 3

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4.	(a) In a Stored Program Control Exchange with respect to the Mean time between failures and mean time to repair, compare mathematically the Unavailability factor while using a single processor and a double processor. (b) Given that $MTBF = 2000 \text{ hrs}$ and $MTTR = 4 \text{ hrs}$. Calculate the unavailability for single and dual processor systems for 10 years and 30 years. (c) Compare between circuit switching and message switching in brief.	6 + 3 + 7
5.	(a) Mention the different types of links in Signaling Link architecture and present a scheme to map the SS7 protocol architecture with that of the OSI model. (b) With reference to the Grade of Service (GOS) in traffic engineering assess the importance of the concept of the blocking criteria, delay criteria, and congestion in the determination of the same.	10 + 6
6.	(a) Illustrate human speech strength at various frequencies with the help of a speech spectrum when the electrical oscillations of the voice are so designed to be transmitted over the telephone channel. (b) If the number of crosspoints in the example is to be reduced by the factor of 3 with non-blocking what is the probability that a call will be blocked? Assume the utilization probability $p = 15\%$. (c) For a non-blocking system supported by the cyclic controlled system, write an expression for the switching capacity. How will be the expression differ, if one tries to achieve full availability by making one of the controls memory-based?	8 + 4 + 4
7.	(a) Enlist the three components of a browser. What is a URL and what are its components? How is HTTP related to WWW? Why do we need POP3 or IMAP4 for electronic mail? (b) Explain in brief the protocols associated with the application and session layers in a secured computer communication. (c) Explain the TCP three-way handshake process.	$(2 \times 4) + 4 + 4$
8.	(a) What is the essence of Time-Space (TS) Switching? (b) Calculate the blocking probability of TS Switching. (c) Discuss in brief the basic steps to process a call. (d) If a group of 20 trunk carries 10 erlangs and the average call duration is 3 minutes, calculate i) average number of calls in progress ii) total number of calls originating per hour. (e) 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 (a) Traffic offered, (b) Traffic carried, (c) GOS, and (d) The total duration of period of congestion.	3 + 3 + 3 + 3 + 4
9.	(a) Explain in brief the Flat Addressing and Hierarchical Addressing schemes in network design. (b) Compare between: In-channel signaling and Common channel signaling. (c) Explain the operation of the Data Link Layer with its sublayers and the Network layer highlighting the Protocol Data Units (PDUs) involved in each case.	4 + 4 + 8