BACHELOR OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING EXAMINATION – 2019

(3rd Year 2nd Semester)

COMMUNICATION SWITCHING SYSTEM

Full marks: 100 **Time: Three hours**

GROUP: A

Answer any three questions.

1. a) Draw a 4x4 crossbar network. Explain the mechanism to be used if there are only four row control lines and four column control lines, for controlling the individual crosspoints.
   b) State Clos theorem. Show the figure of a 3 stage Clos network.
   c) Define blocking, strictly nonblocking and rearrangeably nonblocking switching network. [7+7+6]

2. a) Discuss time slot interchange switch in time multiplexed time switching system.
   b) Calculate the maximum access time that can be permitted for the data and control memories in a TSI switch with a single input and single output trunk multiplexing 2500 channels. Also, estimate the cost of the switch.
   c) Calculate the access time of the memory modules in parallel in/serial out time switch using 64 input and 64 output streams with each stream multiplexing 32 channels.
   d)How many subscriber can be supported in bidirectional PAM switching bus, if the pulse width of the PAM sample is 125 ns?
   e) What is TSI and what is its role in time-division switching? [7+3+4+2+4]

3. a) Define the term "occupancy of a trunk".
   b) During the busy hours, on average, a customer with a single telephone line makes 5 calls; and receives 8 calls; the average call duration is 3 minutes. Find the probability that a caller will find the line engaged.
   c) Considering a full- availability group of N trunks with offered traffic A Erlangs;
   Show that the grade of service $(B) = \dfrac{\dfrac{A^N}{N!}}{\sum_{K=0}^{N} \dfrac{A^K}{K!}}$
   d) A group of 20 trunks provides a grade of service of 0.01 when offered 12 E of traffic. How much does the grade of service deteriorate if one trunk is out of service? [3+5+6+6]

4. a) Consider a system with N trunks, offered traffic A.
   I. Assuming that the system can contain infinitely many queues; derive the expression for the probability of delay; the Erlang delay formula; under statistical equilibrium.
   II. Now consider a practical system which cannot contain an infinite queue. When the queue is full, calls that arrive subsequently are lost. If the queue can hold only up to 5 calls; and the system has 10 trunks offered traffic 2 E, derive an expression for the probability of delay. [10+10]

GROUP: B

Answer any two questions

5. a) Compare the data rates for Standard Ethernet, Fast Ethernet, Gigabit Ethernet, and Ten-Gigabit Ethernet? How the efficiency of Standard Ethernet is measured? In the Standard Ethernet with the transmission rate of 10 Mbps, length of the medium is 2500 m and the size of the frame is 512 bits. Calculate the percentage efficiency. (The propagation speed of a signal in a cable is 2×10^8 m/s) [4+2+4]

   b) Show the frame format of Ethernet, discuss each field and mention the maximum and minimum frame and data length. Give examples of bit-stuffing and character stuffing in frame payload. A network using CSMA/CD has a bandwidth of 10 Mbps. If the maximum propagation time is 25.6 μs, what is the minimum size of the frame? [5+3+2]

6. a) Discuss the control access methods in multiple access control.
   If there are only 3 active stations in a slotted Aloha network; A, B, and C; each station generates a frame in a time slot with the corresponding probabilities 0.2, 0.3, and 0.4 respectively, what is the throughput of each station? What is the throughput of the network?

   b) Define Linear Block Code and Galois Field. Construct a double error correcting BCH code over GF (2^4). [10+10]

7. Write short notes on any two of the following:
   a) Persistence methods in CSMA
   b) Address resolution protocol (ARP)
   c) CDMA
   d) Signalling System 7 protocol (SS-7) [10X2]