

Roll No-

The LNM Institute of Information Technology

Electronics and Communication Engineering Department

Telecommunication Switching Systems and Networks(ECE 4131)

Date:27/02/2019

Mid Term- 2019

 Class Size: 96 R
 Full Marks 50

Time : 1.5Hrs

	CO1	CO2	CO3	CO4	CO5
Questions	1	2,4c,4d	3,4a,4b	-	-
Marks	8+2	15+8	10+7	-	-
Marks/Max Marks (%)	20	46	34	-	-

Answer must be brief and to the point. Symbols have their usual meaning. All parts of the question must be answered in sequence.

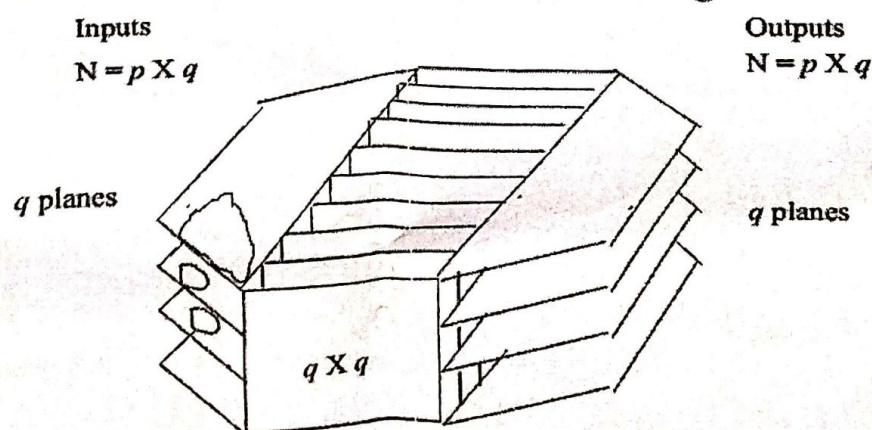
- Q1.** a) How many LATA and POP should be there in the switching system?
 b) Classify Telecommunication Network in terms of Service, Transmission, Switching and Multiplexing.
 c) In PDH multiplexing from 140 Mbps to 2Mbps, how many Multiplexers are required?
 d) Find an expression for time elapsed between call request and call termination for a n hop circuit switching. [2+3+2+3=10]

- Q2.** a) Derive the approximate blocking probability for a 5 stage TSSST switch using Lee' graph method.
 b) Determine the implementation complexity of 2048 channel STS switch implemented for 32 TDM links with 64 channel per link. The desired maximum blocking probability is 0.002 for channel occupancy probability is 0.1.

$$SC_{STS} = 2kN + \frac{1}{100} (2kC \log_2 N + kC \times 8 + kC \log_2 C)$$

- c) An exchange for 2000 subscribers is to be installed and it is required that the blocking probability should be below 10 %. If E2 links are used to carry the subscriber traffic to telephone network, how many E2 links are needed? In E2 link No of Voice circuit is 120.
 Given average call lasts 6 min- a subscriber places one call during a 2-hour busy period(on the average).
 d) Find the complexity of the switch structure given below.

Strict sense non-blocking



[3+4+4+4=15]

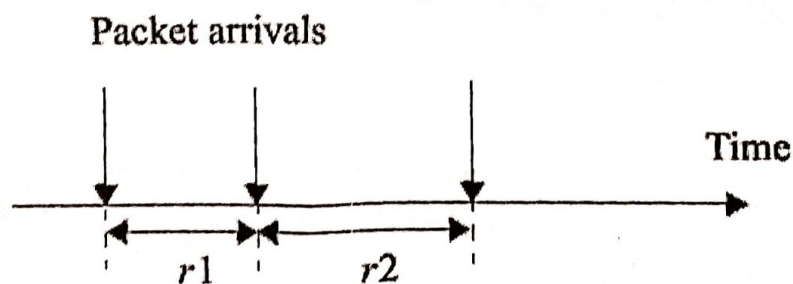
- Q3. a) For a M/M/1 queuing system show that $p_j = (1 - \rho)\rho^j$
- b) A printer is attached to the LAN of a department. The printing jobs are assumed to arrive with a Poisson intensity λ and the printing times are assumed to obey exponential distribution with parameter μ . The capacity of the printer has become inefficient with respect to increased load. In order to improve the printing service there are two alternatives-
- Replace the old printer with a new printer with twice as fast as the old one
 - Add another similar printer to the printing job.

Which one is better in terms of job completion time?

[3+7=10]

- Q4. a) Consider the M/M/1/ ∞ system which is the same as M/M/1. Show that the average number of customer in the queue is $E[N_Q] = \frac{\rho^2}{1-\rho}$

- b) Consider a packet stream whereby packets arrive according to a Poisson process with rate 10 packets/sec. If the inter-arrival time between any two packets is less than the transmission time of the first to arrive, the two packets are said to collide. Find the probabilities that a packet does not collide with either its predecessor or its successor, and that a packet does not collide with another packet assuming all packets have a transmission time of 20ms. Let r_1 and r_2 be the inter arrival times between a packet and its immediate predecessor, and successor respectively as shown in the figure below. Let τ_1 and τ_2 be the lengths of the predecessor packet, and of the packet itself respectively.



- c) Show that the implementation complexity of TST switch is given by

$$SC = N^2 + \frac{1}{100} (NL \log_2 N + 2NC \times 8 + 2NI \log_2 I)$$

- d) Consider a lost calls returning system. The first attempt offered traffic load is 6.22 E. If the number of outgoing trunks is 15, calculate the blocking probability. Also calculate the overall offered traffic and the carried traffic.

[3+4+4+4=15]