USN | | | | | | | | | | |

08EC051

M.Tech. Degree Examination, December 2010
Modeling and Simulation of Data Networks

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Explain the assumptions on the arrival and service statistics of a M/M/1 system. **(08 Marks)**

b. If m traffic streams of equal length packets, arrive according to a Poisson process with rate x/m each, and the traffic streams are frequency decisions multiplexed and time division multiplexed on m subchannels, then show that, customers average total delay is more favourable in TDM than in FDM. Assume M/D/1 queuing system. **(12 Marks)**

2 a. Persons arrive at a xerox machine according to a Poisson process with rate one per minute. The number of copies to be made by each person is uniformly distributed between 1 and 10. Each copy requires 3 sec. Find the average waiting time in queue when : i) each person uses the machine on a first come first serve basis ii) persons with non more than 2 copies to make are given non preemptive priority over other person. **(10 Marks)**

b. State and prove Jackson's theorem for closed networks. **(10 Marks)**

3 a. List the assumptions of slotted multi-access model. **(05 Marks)**

b. Show that the maximum throughput, for small β is approximately the same for CSMA slotted Aloha and FCFS splitting with CSMA. **(07 Marks)**

c. For the network shown in fig.3(c), draw the contrast in finding shortest path using Dijkstra and Bellman Ford algorithm. **(08 Marks)**

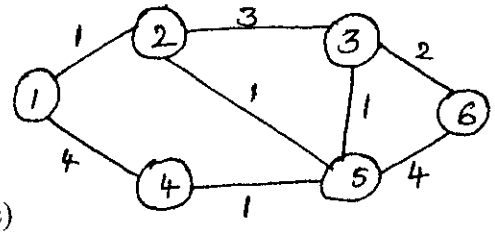

Fig. 3(c)

4 a. Distinguish between hierarchical and nonhierarchical routing. **(06 Marks)**

b. Explain how busy tone approach improves the performance of carrier sensing in packet radio network. **(04 Marks)**

c. A communication line capable of transmitting at a rate of 50 kbits/sec will be used to accommodate 10 sessions each generating Poissons traffic at a rate 150 packets/min. Packet lengths are exponentially distributed with maximum 1000 bits.

i) For each session, find the average number of packets in queue, the average number in the system and the average delay per packet, when the line is allocated to the sessions by using 1) 10 equal capacity time division multiplexed channel 2) statistical multiplexing.

ii) Repeat (i) for the case, where five of the sessions transmit at a rate of 250 packets / min while the other five transmit at a rate of 50 packets/min. **(10 Marks)**

5 a. Briefly explain various sources of delay, when a packet arrives from the network. **(10 Marks)**

b. Explain the reservation approach for multi-access scheduling. **(10 Marks)**

6 a. Two communication nodes 1 and 2 send files to another node 3. Files from 1 and 2 require on the average R1 and R2 time units for transmission respectively. Node 3 processes a file of node i(i = 1, 2) in an average of Pi time units. If λ_i is the throughput of node i in files sent per unit time, what is the reason of all feasible throughput pair (i_1 , i_2) for the system. **(10 Marks)**

b. Explain call blocking and packet blocking approaches to flow control. **(06 Marks)**

c. Briefly explain the drawbacks of end to end window strategy. **(04 Marks)**

7 a. Consider the M/G11 system with the difference that each busy period is followed by a single vacation interval. Once this vacation is over, an arriving customer to an empty system starts service immediately. Assume that vacation intervals are independent identically distributed and independent of the customer inter arrival and service times. Prove that the average waiting time in queue is $W = \frac{\lambda \overline{X}_2}{2(1-\rho)} + \frac{\overline{V^2}}{2I}$. **(10 Marks)**

b. With an example network, explain min – max flow control. **(10 Marks)**

8 a. Using Kleinrock independence approximation, obtain optimal cost for a pair of subnet nodes. **(10 Marks)**

b. Explain DQDB architecture. **(10 Marks)**