C7-R3: ADVANCED COMPUTER NETWORKS

NOTE:

> 1. **Answer question 1 and any FOUR from questions 2 to 7.**
> 2. **Parts of the same question should be answered together and in the same sequence.**

Time: 3 Hours **Total Marks: 100**

1.
a) What does supernetting mean and why is it developed?
b) Suppose that a radio system uses a 9600 bps channel for sending call setup request messages to a base station. Suppose that frames are 120 bits long. What is the maximum throughput possible with aloha and with slotted aloha?
c) What do you mean by X-MODEM?
d) Consider the statistical multiplexer that has transmission line with a speed of 64 kbps. Suppose that average packet length is 1000 bytes and that the average arrival rate is 4 packets per second. Compare the average packet delay for the constant length packet to exponentially distributed packet (M/M/1).
e) Explain the differences between the traffic class and the flow label field in IPv6 header.
f) List and briefly define the ATM service categories.
g) Describe the ISDN standards define between the user and the network.

(7x4)

2.
a) Why is UDP necessary when IP already provides a connectionless delivery service?
Give an example using UDP packets between the same pair of client and server machines. In your example three of the four fields (IP address1, port1, IP adress2, and port2) should be same but one field should be different. Explain how multiplexing and de-multiplexing is correctly done in this case.
b) Discuss IP features. Describe what does IP not provides. And briefly explain the IP datagram format.
c) List and briefly define the key elements of SNMP.

(6+7+5)

3.
a) Explain how the notion of connectivity differs from an equivalent of a "physical link".
b) List the major advantages with the layered approach to protocols. Discuss the ISO OSI reference model.
c) What is multiplexing and how does it improve the system design? Why is the statistical multiplexing not good for system whose load characteristics have no variations.

(5+7+6)

4.
a) How is OSPF protocol used as interior routing protocol in IP routing? Use a sample autonomous system for describing the above.
b) Explain ALOHA and SLOTTED ALOHA. And show that the throughput of SLOTTED ALOHA is twice of pure ALOHA.
c) What do you understand by MIME?

(8+5+5)

5.
a) Explain why ATM networks are required and briefly explain the ATM cell header.
b) Briefly, explain the various types of ATM adaptation layers protocols that have been developed to support application over ATM connections.
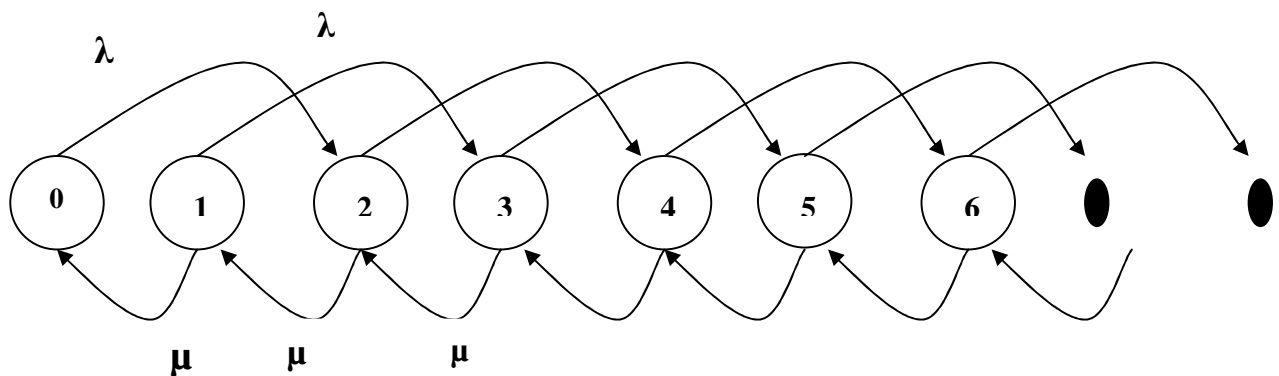c) Describe the difference between virtual channel and virtual path.

(6+6+6)

6.
a) Explain the protocol and architecture of DQDB and describe its merits and demerits.
b) What is ISDN and compare it with BISDN. Also draw and explain the architecture of BISDN.
c) Write short note on SS-7 signaling schemes.

(6+6+6)

7.
a) What is TCP? Connection termination in TCP is symmetric whereas connection establishment is not. Why?
b) Draw and explain the delay model of asynchronous TDM.
c) Consider M/M/I queuing systems with infinity buffers, arrivals according to a possion's process with rate λ and Packets size exponentially distributed with parameter μ. We introduce the change that each arrival implies two packets arriving at the queue. The server still serves only one packet at a time at rate μ. The state transition diagram for this system is given below

i)   Write the balance equation at state 0, 1, and 2 respectively. Write the equation in terms of $\rho=\lambda/\mu$ .and P_0 (steady state probability at state 0).
ii) Generalize the balance equation for any given state and $n>=2$, in terms of $\rho=\lambda/\mu$ and P_{n-1} and P_{n-3}.
iii) What is the condition on λ for the system to be stable?

(6+6+6)