Nirma University

Institute of Technology

Semester End Examination (IR/RPR), December 2018

B. Tech. in Computer Engineering, Semester V

CE503 Computer Networks

Roll/ Exam No.		Supervisor's initial with date	

Time: 3 Hours — Max. Marks: 100

Instructions:

1. Attempt all questions.
2. Figures to the right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Assume suitable data wherever necessary and specify them.

Section - I

Q.1 Answer the following: 16

a) How do you compare LAN and PAN in terms of the service and protocols requirements? 4

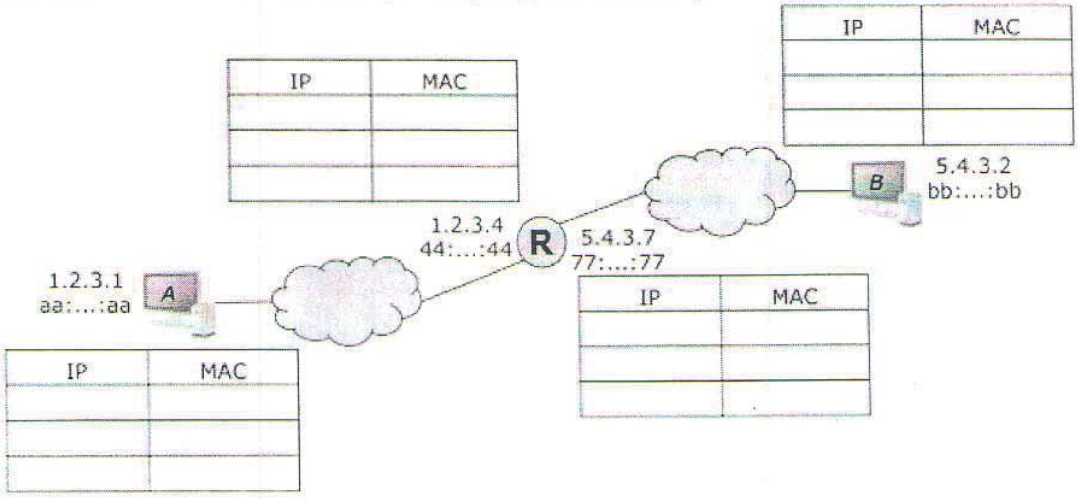
b) Why do data link layer protocols need framing? What are the consequences of not having framing as part of DL protocol? 4

c) Compare feedback-based flow control with rate-based and credit-based flow control with a example of each technique. 4

d) Compare and contrast store-and-forward switching with cut-through switching. 4

Q.2 Answer the following: 18

a) The diagram below shows two subnets connected by a router (R). For each host and router port, the IP address and MAC address (abbreviated) are shown. Initially the ARP tables of the hosts and router are empty. Suppose A sends a ICMP echo request to B to test connectivity. Show the contents of the ARP tables after the successfully verifying connectivity. 6



b) Consider a 150 Mb/s link that is 800 km long, with a queue large enough to hold 5,000 packets. Assume that packets arrive at the queue with an average rate of 40,000 packets per second and that the average packet length is 3,000 bits. 6

- What is the propagation delay for the link?
- What is the transmission time for an average length packet?
- What is the link utilization?

c) Consider an error-free 64-kbps satellite channel used to send 512-byte data frames in one direction, with very short acknowledgments coming back the other way. What is the maximum throughput for window sizes of 1, 7, 15, and 127? The earth-satellite propagation time is 270 msec. 6

OR

c) A 1-km-long, 10-Mbps CSMA/CD LAN (not 802.3) has a propagation speed of 200 m/μsec. Repeaters are not allowed in this system. Data frames are 256 bits long, including 32 bits of header, checksum, and other overhead. After a successful reception, receiver sends a 32-bit acknowledgement frame. What is the effective data rate, excluding overhead, assuming that there are no collisions? 6

Q.3 Answer the following: 16

a) What kind of MAC algorithm is suitable at low load and high load condition in network? Propose some mechanism which works adaptively in the two extreme network conditions. 6

OR

a) Justify the requirement of minimum frame length in IEEE 802.3. 6

b) A 1-km-long, 10-Mbps CSMA/CD LAN (not 802.3) has a propagation speed of 200 m/μsec. Repeaters are not allowed in this system. Data frames are 256 bits long, including 32 bits of header, checksum, and other overhead. The first bit slot after a successful transmission is reserved for the receiver to capture the channel in order to send a 32-bit acknowledgement frame. What is the effective data rate, excluding overhead, assuming that there are no collisions? 6

c) How is it possible to prioritize frames in Wireless LAN? Why is it necessary to assign high priority to acknowledgement frames? 4

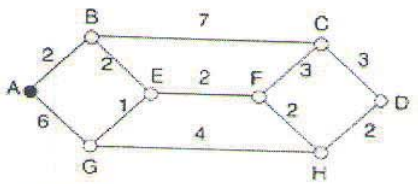
Section - II

Q.4 Answer the following: 18

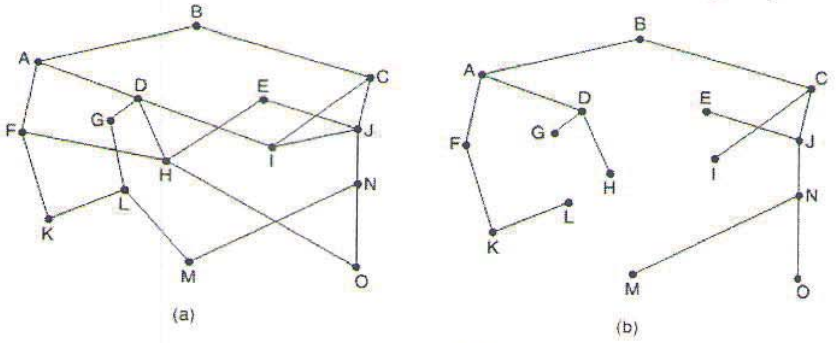
a) Consider the network in the figure. 11

(i) Find the shortest path between A to D using Dijkstra algorithm.

(ii) Ignore the weights on the lines in the figure. Suppose that it uses flooding as the routing algorithm. If a packet sent by A to D has a maximum hop count of 3, list all the routes it will take. Also tell how many hops worth of bandwidth it consumes.



b) How many packets are generated by a broadcast from B, using (a) reverse path forwarding? (b) the sink tree? (c) Restricted Flooding. Depict your calculation. 7



OR

b) If a server crashes in the middle of the transport connection and reboots quickly, what are the possible strategies for the server and the client to resume the connection? Give possible outcomes, in terms of packet loss/duplicate/perfect, for different combinations of server and client strategies. 7

Q.5 Answer the following: 16

a) An organization is given the network id 198.16.128.0/17. Suppose that four departments A, B, C, and D request 1024, 2048, 8192, and 4096 addresses respectively and in that order. For each of these, give the first IP address assigned, the last IP address assigned and the network id in the w.x.y.z/s notation. 7

b) Explain with example how a name resolution is done in DNS using iterative and recursive query mechanism. 5

OR

b) How does a router allocate bandwidth to different transport layer flows to avoid congestion using Max-min fairness? 5

c) A computer on a 10-Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 2 Mbps. It is initially filled to capacity with 8 megabits. How long can the computer transmit at maximum rate possible? 4

Q.6 Answer the following: 16

a) A router has just received the following new IP addresses: 57.6.96.0/21, 57.6.104.0/21, 57.6.112.0/21, and 57.6.120.0/21. 6

a) If all of them use the same outgoing line, can they be aggregated? If so, to what? If not, why not?

b) If for all but one network 57.6.112.0/21 is reachable through different outgoing line then can they be aggregated? If so, how? If not, why not?

b) A router has the following (CIDR) entries in its routing table: 5

Address/mask	Next hop
135.46.56.0/22	Interface0
135.46.60.0/22	Interface1
192.53.40.0/23	Router1
default	Router2

For each of the following IP addresses, what does the router do if a packet with that address arrives?

(a) 135.46.63.10

(b) 135.46.57.14
(c) 135.46.52.2
(d) 192.53.40.7
(e) 192.53.56.7

c) Distance vector routing is used, and the following vectors have just come in to router C: from B: (4, 0, 7, 11, 5, 1); from D: (15, 11, 5, 0, 8, 9); and from E: (6, 5, 2, 8, 0, 3). The cost of the links from C to B, D, and E, are 7, 4, and 6, respectively. What is C's new routing table? Give both the outgoing line to use and the cost. 5