NIRMA UNIVERSITY

Institute of Technology

Semester End Examination (RPR), July 2022

B. Tech. in Computer Science and Engineering, Semester V

2CS502: 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. **Use section-wise separate answer book.**
4. **Draw neat sketches wherever necessary.**
5. **Assume necessary data if required.**

SECTION – I

Q.1 Answer the following: **[18]**

i) A 120 Km long cable supports 3 Mbps data rate. The propagation speed in the cable is 2/3rd of the speed of the light in the vacuum. How many bits fit in the cable? **(4)**

ii) Why minimum frame size is required in Ethernet? What should be the minimum frame size for 20 Mbps Ethernet with maximum cable length of 2.5 Km (with four repeaters)? **(4)**

iii) Connection oriented service does not always mean finding a path between sender and receiver and using same path for forwarding packets of that connection (True/False). Justify. **(4)**

iv) Define clearly subnet, networks and internetworks. **(2)**

v) What do you mean by 'store and forward' networking paradigm? **(2)**

vi) What is promiscuous mode of LAN interface? It is applicable in switched Ethernet? Why? **(2)**

Q.2 Answer the following: **[16]**

A) Explain the need of pipe-lining at data link layer. Derive the equation representing line utilization in case pipe-lining is used. **(7)**

OR

A) Write pseudo code for simplex stop-and-wait protocol for erroneous channel. **(7)**

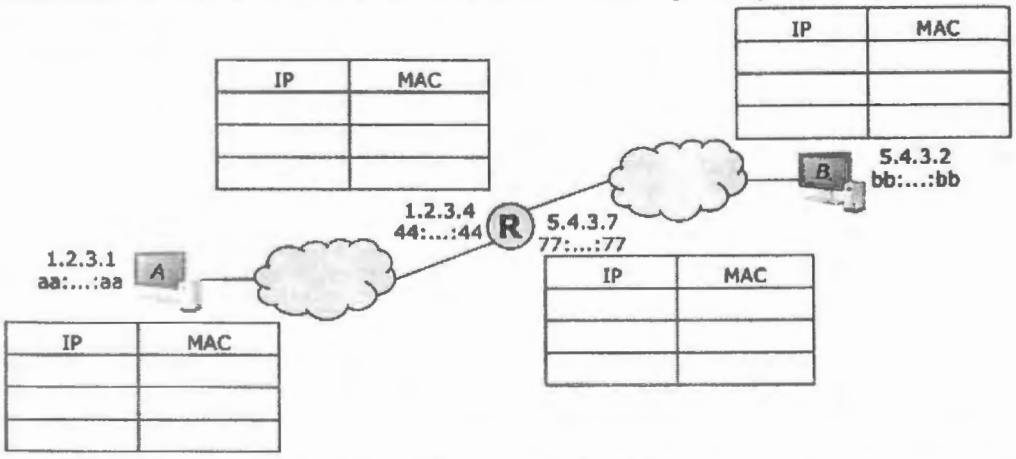
B) What is Binary Exponential Algorithm of CSMA/CD? Discuss the rationale behind the algorithm design. **(5)**

C) Two stations, A & B connected via point-to-point link and exchange frames using Go-back-N sliding window protocol with window size 7. Sequence number is of 3 bits. Station A sends frame 0 to 6. B receives **(4)**

them in order but frame 4 was damaged. So what will be the buffer frames in the current window of A?

Q.3 Answer the following: **[16]**

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) In some networks, the data link layer handles transmission errors by requesting damaged frames to be retransmitted. If the probability of a frame's being damaged is P, what is the mean number of transmissions required to send a frame? Assume that the acknowledgements are never lost. **(5)**

OR

B) Discuss performance of non-persistent, p-persistent and 1-persistent CSMA under various traffic load conditions in the network. **(5)**

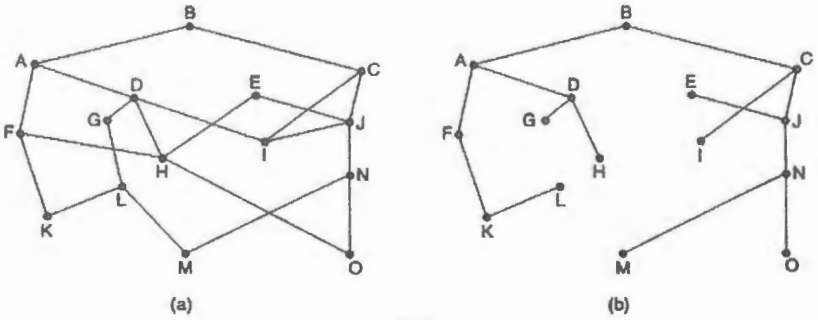
C) Analyze the best case, worst case and average case channel efficiency of Bitmap protocol for channel access. **(5)**

SECTION – II

Q.4 Answer the following: **[16]**

A) If 5 stations are communicating using CSMA/CA with RTS/CTS protocol. Is it possible for two packets to collide? Explain your answer with neat example. **(6)**

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. **(6)**



OR

B) A token bucket scheme is used for traffic shaping. A new token is put into the bucket every 5 μsec. Each token is good for one short packet, which contains 48 bytes of data. What is the maximum sustainable data rate? **(6)**

C) i) Sketch the Manchester encoding on a classic Ethernet for the bit stream 0001110101. **(4)**

ii) Give two reasons why networks might use an error-correcting code instead of error detection and retransmission.

Q.5 Answer the following: **[18]**

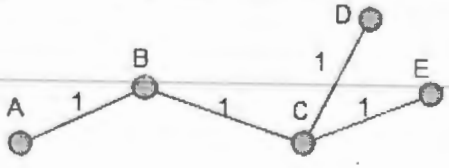
A) An organization is given the network id 18.10.128.0/17. Suppose that four departments A, B, C, and D request 512, 2048, 1024, and 4096 addresses respectively and in that order. For each of the request, give the first IP address assigned, the last IP address assigned and the network id in the w.x.y.z/s notation. **(6)**

B) Explain with example how a name resolution is done in DNS using iterative and recursive query mechanism. **(6)**

OR

B) Demonstrate three-way handshaking protocol used for establishing a new connection at transport layer. **(6)**

C) Assume distance vector routing is implemented in the following topology. Link between A and B breaks. Show updation of routing tables. **(6)**



Q.6 Answer the following: **[16]**

A) A router has just received the following new IP addresses: 157.6.96.0/21, 157.6.104.0/21, 157.6.112.0/21, and 157.6.120.0/21. **(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 157.6.112.0/21 is reachable through different outgoing line then can they be aggregated? If so, how? If not, why not?

B) If the TCP round-trip time, *RTT*, is currently 30 msec and the following acknowledgements come in after 26, 32, and 24 msec, respectively, what is the new *RTT* estimate using the Jacobson algorithm? Use $\alpha = 0.7$. **(6)**

C) LISTEN is a blocking call. Is this strictly necessary? If not, explain how a nonblocking primitive could be used. What advantage would this have over the transport entity using blocking system call? **(4)**