SUPPLEMENTARY EXAMINATION-2023
5th Semester B.Tech
COMPUTER NETWORKS
IT 3009

(For 2021 (L.E), 2020 & Previous Admitted Batches)

Time: 3 Hours   Full Marks: 50

Answer any SIX questions.
Question paper consists of four SECTIONS i.e. A, B, C and D.
Section A is compulsory.
Attempt minimum one question each from Sections B, C, D.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable
and all parts of a question should be answered at one place only.

SECTION-A

1.   Answer the following questions.   [1 × 10]

(a)   What is the need for layering in computer network that all the suggested models have?

(b)   Mention the different types of delays that occur at various nodes during communication in a network.

(c)   When an HTTP server receives a request message from an HTTP client, how does the server know when all headers have arrived and the body of the message is to follow?

(d)   A new application is to be designed using the client-server paradigm. If only small messages need to be exchanged between the client and the server without the concern for message loss or corruption, what transport-layer protocol do you recommend?

(e)   Mention the need for two types of addressing, i.e., IP address and MAC address, to communicate from one node to another in a computer network.

(f)   Specify under what circumstance tcp state goes directly from FIN_WAIT_1 to TIME_WAIT?

(g) Why routing is the responsibility of the network layer? Why cannot the routing be done at the transport layer or the data-link layer?

(h) The actual TCP header length in an IPv4 packet can vary from 20 to 60 bytes, where as it cannot be possible to have a TCP header length of 38 bytes. Why so?

(i) When a router discards a packet, for whom it generates an ICMP message regarding the error encountered?

(j) Explain why collision is an issue in random access protocols but not in controlled access or channelizing protocols.

SECTION-B

2. (a) What is the end-to-end packet delay in network which has 2 intermediate routers under the scenario that when a packet arrives at router 2, there are three packets enqueued? Assume distance of all links are 100 km, link speed is 100Mbps, propagation speed of the medium is $10^{\wedge}8$m/sec and all packets are of sizes 1000 bits. [4]

(b) List all the layers in OSI hierarchy and discuss their functions. Why such hierarchical approach to networking in utilized. Compare OSI Model with TCP/IP reference model. [4]

3. (a) Assume that the timeout values in Selective Repeat(SR) protocol is sufficiently long such that 5 consecutive data segments and their corresponding ACKs can be received (if not lost in the channel) by the receiving host (Host B) and the sending host (Host A) respectively. Suppose Host A sends 5 data segments to Host B, and the 2nd segment (sent from A) is lost. In the end, all 5 data segments have been correctly received by Host B. [4]

a. How many segments has Host A sent in total and how many ACKs has Host B sent in total? What are their sequence numbers?

b. If the timeout value is longer than 5 RTT, then calculate the time taken by SR protocol to successfully deliver all the five data segments?

(b) Why in selective repeat protocol the maximum window size is 2^{m-1} while in Go-Back-N it is 2^m-1? Justify your answer. [4]

SECTION-C

4. (a) An administrator has given an IP 192.168.1.0/24 and wants to form four networks. The first network with 100 hosts, second network with 60 hosts, third netwok with 10 hosts, and the last netwok with 40 hosts. Design the subnets and find out whether it is feasible or not. If not suggest a network id with netmask. [4]

(b) Explain in detail, all the headers responsible for fragmentation and Reassembly of datagram. Why reassembly of datagram happens at the end host not at the intermediate routers? Justify. [4]

5. (a) Explain how CRC is used in detecting errors for the polynomial, $g(x)=x^4+x+1$. Consider the information sequence 1101011011. [4]

   i. Find the codeword.

   ii. If the code word has an error in the third leftmost bit, what does the receiver obtain when it does error checking

(b) Describe the Frame format of Ethernet in detail. Justify, why there is a restriction on the minimum as well as maximum frame size of Ethernet. [4]

6. (a) Use linkstate routing algorithm to find the least cost tree for node A in the following Figure. [4]
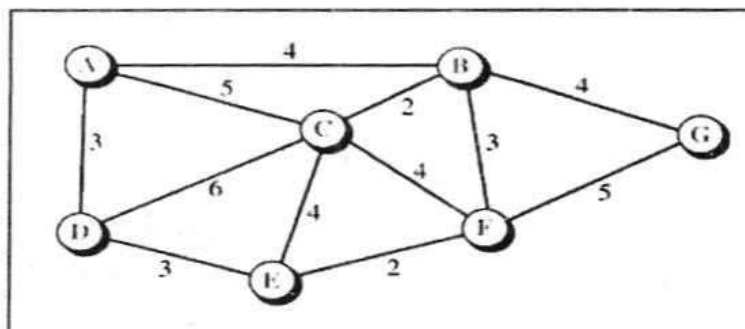
(b) Discuss the significance of MAC address, IP address and [4] port numbers explain each with an example. Can we exclude any address during the communication between source to destination?

Specify the range of port address used for well-known ports and at least mention five port addresses used by popular applications? Mention the Private IP address and their uses.

SECTION-D

7. (a) Two hosts A and B are communicating with each other using [4] TCP. Assume the sequence number field starts at 0 and the receiver employs cumulative ack. A has successfully sent 465 bytes of data which were also acked by B. Suppose A were now to send 3 segments of size 100,40 and 60. What sequence number will the third segment carry? Suppose second segment was received before the first and third segment, What will the ack value be in the ack generated as a consequence of receiving this second segment?

(b) What are the flow and error control mechanism used in [4] transport layer? Briefly explain. Suppose that the GBN protocol is used on a link with a bit rate of 64 kilobits per second and 20 milliseconds propagation delay. Assume that the transmission time for the acknowledgment and the processing time at nodes are negligible. What is the minimum frame size in bytes to achieve a link utilization of at least 100% for a window size of 7?

8. (a) Explain how CSMA/CD protocol helps to detect collision [4] in networks. What is the significance of Jam signal and Back off time in CSMA/CD method?

(b) In which persistent techniques used by CSMA protocol, a [4] channel can be idle at the end of a transmission even when there are nodes with traffic to send. Discuss, why CSMA protocol alone is not able to handle the collision rather a collision detection scheme is added on top of it to handle the same.

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