(e) List two advantages of deploying a Web cache (i.e. a proxy server) in an institutional network.

(f) Do routers have IP addresses? If so, how many?

(g) Suppose Host A sends Host B a TCP segment encapsulated in an IP datagram. When Host B receives the datagram, how does the network layer in Host B know it should pass the segment (that is, the payload of the datagram) to TCP rather than to UDP or to something else?

(h) What is the significance of header length(HLEN) field of TCP segment? What will be its value when TCP header does not include any options and padding?

(i) The sequence number field in the TCP header is 32 bits long, which is big enough to cover over 4 billion bytes of data. Even if this many bytes were never transferred over a single connection, why might the sequence number still wrap around from $2^{32} - 1$ to 0?

(j) Is it possible for the sender to receive an acknowledgement for a packet that falls outside its current window? If so, then explain the scenario when it might occur.

SECTION-B

2. (a) In Selective Repeat protocol, suppose frames through 0 to 4 have been transmitted. Now, imagine that 0 times out, 5 (a new frame) is transmitted, 1 times out, 2 times out and 6 (another new frame) is transmitted. At this point, what will be the outstanding packets in sender's window? [4]

(b) Explain count to infinity problem through an example? Discuss the mechanism used by routing protocols to overcome this. Compare Open shortest path first protocol (OSPF) with Routing information protocol. [4]

3. 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.

(b) Consider sending a large file from a host to another over a TCP connection that has no loss. Suppose TCP uses AIMD for its congestion control without slow start. Assuming *cwnd* increases by 1 MSS every time a batch of ACKs is received and assuming approximately constant round-trip times, how long does it take for cwnd increase from 5 MSS to 11 MSS (assuming no loss events)? [4]

SECTION-C

4. (a) Explain why TIME-WAIT is a somewhat more serious problem if the server initiates the close than if the client does. Describe a situation in which this might reasonably happen. [4]

(b) Explain functions, protocols and services of each layer of TCP/IP model. Comment how it is different from OSI Model. [4]

5. (a) Differentiate between broadcast and multicast communication. Explain a scenario where limited broadcast will not help rather directed broadcast will be used to make the communication possible. [4]

(b) Explain Addressing and Channel access control mechanism for Ethernet LAN. [4]

6. (a) Host A and B are directly connected with a 100 Mbps link. There is one TCP connection between the two hosts, and Host A is sending to Host B an enormous file over this connection. Host A can send its application data into its TCP socket at a rate as high as 120 Mbps but Host B can read out of its TCP receive buffer at a maximum rate of 60 Mbps. Describe the effect of TCP flow control. [4]

(b) Describe the various components of a router. Discuss the scenarios where packet loss can occur at the input ports of a router and describe how these packet losses at the input ports can be eliminated (without using infinite buffers). [4]

SECTION-D

7. (a) We have said that an application may choose UDP for a transport protocol because UDP offers finer application control (than TCP) of what data is sent in a segment and when. [4]

a. Why does an application have more control of what data is sent in a segment?

b. Why does an application have more control on when the segment is sent?

(b) You are hired to design a reliable byte-stream protocol that uses a sliding window (like TCP). This protocol will run over a 1-Gbps network. The RTT of the network is 140 ms, and the maximum segment lifetime is 60 seconds. How many bits would you include in the *AdvertisedWindow* and *SequenceNum* fields of your protocol header? [4]

8. (a) Discuss the functionality provided by DHCP Server. Explain the need of running DHCP client on a well-known port instead of an ephemeral port. [4]

(b) For a given Class A network represented as 10.0.0.0, the requirement of host per each subnetwork is 500. Find the following information: [4]

(i) Customized subnet Mask used

(ii) Number of Hosts in each subnet

(iii) Range of valid IP numbers that can be assigned in each subnetwork.

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AUTUMN END SEMESTER EXAMINATION-2019

5th Semester B.Tech & B.Tech Dual Degree

COMPUTER NETWORKS

IT3001

(For 2018(L.E) & 2017 Admitted Batches)

Time: 3 Hours Full Marks: 50

Answer any SIX questions.
Question paper consists of four sections-A, B, C, 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) Mention the name of the protocol that allows a client to send a broadcast message with its IP address and receive a MAC address in reply.

(b) Suppose that the UDP receiver computes the Internet checksum for the received UDP segment and finds that it matches the value carried in the checksum field. Can the receiver be absolutely certain that no bit errors have occurred? Explain.

(c) Suppose a process in Host C has a UDP socket with port number 6789. Suppose both Host A and Host B send a UDP segment to Host C with destination port number 6789. How will the process at Host C know that these two segments originated from two different hosts?

(d) An Ethernet MAC sublayer receives 42 bytes of data from the LLC sublayer. How many bytes of padding must be added to the data?