



AUTUMN END SEMESTER EXAMINATION-2022

5th Semester B.Tech

COMPUTER NETWORKS

IT3009

(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) Explain why collision is an issue in random access protocols but not in controlled access or channelizing protocols.
 - (b) Let us assume a packet is now transmitted in a network where no packet transmission happens earlier, then which delay (i.e., Propagation, Queuing, Transmission, or Processing) could be zero?
 - (c) For a given classful IP Address 220.15.1.10, determine the directed and limited broadcast address.
 - (d) The HLEN field in the TCP header has a value of 10 and 1 byte of padding (composed of zeros) is added to ensure that the TCP header ends and data begins on a 32 bit boundary. Find the number of bytes of additional information present as a part of options in the TCP header.



- (e) Let us assume that a HTTP request is made from a client over a persistent connection for downloading a web page containing 8 embeded objects. Calculate the response time for downloading the complete web page at the client end.
- (f) Go back N protocol with a sender's window size of 'S' is given. Let at at time 'T', the next in-order packet the receiver is expecting has a sequence number of 'M'. If the medium is unable to reorder messages, what will be the sequence number of the last packet in sender's window? (Assume the sender has already received the acknowledgments.)
- (g) If the link of a network is 2 Mbps and round trip time in between source and destination is 300 msec, compute the optimal TCP window size required to fully utilize the line?
- (h) UDP is a message-oriented protocol. TCP is a byte-oriented protocol. If an application needs to protect the boundaries of its message, which protocol should be used, UDP or TCP?
- (i) In TCP, how many sequence numbers are consumed by SYN+ACK segment? Justify.
- (j) 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? Justify.

SECTION-B

- 2. (a) Discuss the different phases of Congestion Control in TCP with example. What is the relevance of congestion window in TCP congestion control? [4]
- (b) Consider an instance of TCP's Additive Increase Multiplicative Decrease (AIMD) algorithm where the window size at the start of slow start phase is 2 MSS [4]

and the threshold at the start of first transmission is 8 MSS. Assume that a time out occurs during the fifth transmission. Find the congestion window size at the end of tenth transmission.

3. (a) Explain how cyclic redundancy check (CRC) is used to detect errors. Discuss the benefits and constraints of using CRC method for error handling. [4]
- (b) A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is x^3+1 . [4]
- i. What is the actual bit string transmitted?
- ii. Let the third bit from left is inverted during transmission. How will the receiver detect this error?

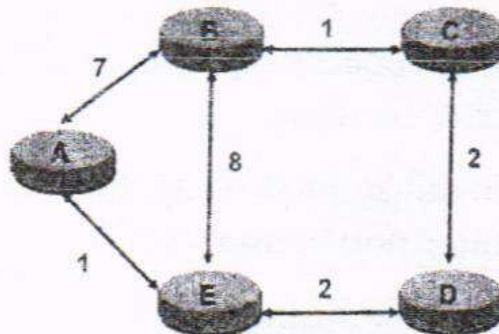
SECTION-C

4. (a) Explain how CSMA/CD protocol helps to detect collision in networks. What is the significance of Jam signal and Back off time in CSMA/CD method? [4]
- (b) A 2 km long broadcast LAN has 10^7 bps bandwidth and uses CSMA/CD. The signal travels along the wire at 2×10^8 m/sec. What is the minimum packet size that can be used on this network? [4]
5. (a) Discuss the need of IP fragmentation in a network. Define the condition in which the router divides the datagram into fragments. Suppose a router receives an IP packet containing 600 data bytes and has to forward the packet to a network with maximum transmission unit of 200 bytes. Assume that IP header is 20 bytes long. What are fragment offset values for divided packets? [4]
- (b) Discuss the IP header with a suitable diagram. Consider subnetting is performed on a big single network with IP Address 200.1.2.0 during the process, the network is [4]

divided into 4 subnets. Compute the configuration of the individual subnets

6. (a) Explain distance vector routing protocol with an example. How it differs from link state routing protocol? [4]

- (b) [4]



Apply distance vector routing in the above network until convergence. Demonstrate the process.

SECTION-D

7. (a) What is an Autonomous system? List and explain the routing protocols used inside and across Autonomous system. [4]

- (b) Elaborate the functionalities of individual layers of OSI model. Explain why OSI is called a model whereas TCP/IP is called a stack. [4]

8. (a) Why the minimum length of the Ethernet data field is 46 bytes. Consider a 10 Mbps Ethernet LAN that has stations attached to a 2.5 km long coaxial cable. Given that the transmission speed is 2.3×10^8 m/sec, the packet size is 128 bytes out of which 30 bytes are overhead, find the effective transmission rate and maximum rate at which the network can send data. [4]

- (b) Write short notes on any two of the following: [4]
- i. ARP vs RARP
 - ii. TCP 4-way handshake for connection teardown
 - iii. Checksum
