Exam:	Final	**Instructor:**	Dr. Faisal Bashir
Type of Paper:	Regular	**Total Marks:**	50
Semester:	Fall	**Time Allowed:**	2 hrs and 30 mins

Instructions:
1. Attempt all questions
2. Write your Index # on question paper and answer book.
3. Please write neatly and number questions and subparts carefully.
4. If a question is unclear, state your assumptions and answer the problem based on your assumptions.
5. Understanding the question is also a part of the examination.

Q1. Suppose a transport scheme uses selective repeat mechanism for the recovery of missing packets. The window size is 3 and total allowed sequence numbers are 0, 1, 2 and 3. The sender wants to send 20 packets to the destination. Using a figure, explain what problem can arise in this scheme. **[5]**

Q2. Assuming a unidirectional channel between sender and receiver on which no packet is dropped. However, bits may be flipped on the underlying channel. ACKs and NACKs are used for acknowledging correctly received packet and packet received with errors respectively. Moreover, NACK/NACK can also get corrupted. For this scenario, draw a finite state machine showing the events and actions taken by a sender. **[6]**

Q3. What are the drawbacks of premature and too long RTT in TCP? Also, mention how RTT is estimated in TCP. **[3+2]**

Q4. A client wants to download an object of size 1Mb from a Web Server. Considering maximum segment size (MSS) of 1024B, a fix window size of 8 MSS and an RTT of 1 sec. Calculate how long will it take to receive the complete object at the client after initiating the request. Note: All delays accept for TCP connection establishment and data transmission delay are ignored. Also, there are no losses or corruption of data. **[4]**

Q5. A datagram of 4800 bytes needs to be fragmented before it can be transmitted over an Ethernet. What will be the values of the following fields for each fragmented packet? **[1+1+2]**

   a) Length   b) Fragflag   c) Offset

Q6. Consider the following network which uses distance vector routing, it consists of three routers and labeled link costs. Sequentially list all the changes that will occur in the distance vector tables of Y & Z in the following scenarios. **[2+4]**
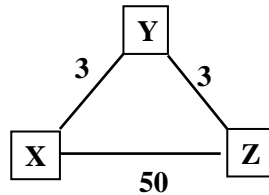
a. If the link cost between X & Y changes from 3 to 1
b. If the link cost between X & Y changes from 3 to 62

Q7. Using Link State algorithm, calculate the link state table for node F in the following network. **[5]**
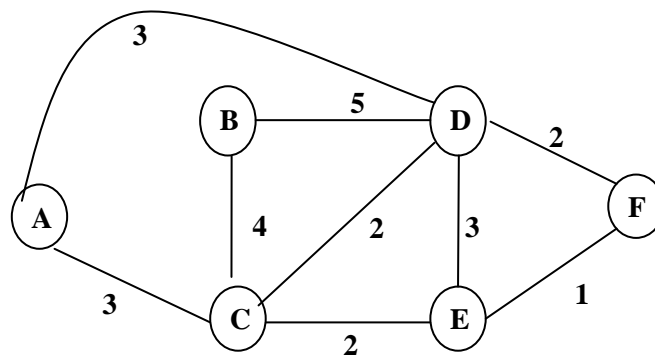
Q8. Explain the operation of CSMA/CD algorithm. On a 5Mbps Ethernet, calculate the maximum and minimum wait time in case of exponential backoffs. **[3+2]**

Q9. Considering, error detection and correction schemes answer the following: **[3+3]**

   a. With the help of a diagram, demonstrate how parity bits can be used for bit error detection and single bit correction.

   b. Assuming any 4 bit CRC polynomial, calculate the CRC bits (remainder) to be attached with a message 1010001011.

Q10. Differentiate between the following: **[2+2]**

   a. HUB and Switch   **b.** ALOHA and slotted ALOHA