Department of Computer Science and Engineering
Motilal Nehru National Institute of Technology
End Semester Exam, Computer Networking(CS502)
BTech (CS) V Semester
Time: 3 Hour, MM:60

Note: There are 6 questions. First Question is Compulsory. Attempt any four from the rest

1. Suppose you are hired as a networking consultant to some institute. Institute currently operates separate in four departments, each having four sections with 100 (can be increased by 100% in 5 years) hosts. The departments are located in neighboring buildings and sections are at different floors of a building. Management wants to interconnect the departmental networks and to connect the resulting institute network to the Internet through a single gateway.
   (a) List the name and number of devices required to configure the network described above.
   (b) Your task is to plan the network and deliver to management a graph of the topology and instructions for system administrators on how to configure the routing tables, plan the addressing scheme and do route summarization.
   (c) Based on your design, also state the sequence of actions performed at every layer of the devices involved:
      - When two interdepartmental nodes want to have telnet session.
      - When two intra-departmental nodes want to have telnet session.
      - When user from any department wants to check his/her Gmail.

2. (a) Consider a network in which for each link, the link capacity is greater than the sum of the input rates for all end systems in the network.
      - Is congestion control needed in this scenario? Why?
      - Is flow control needed in this scenario? Why?
      - Would it be better to use circuit-switching or packet-switching in this network? Why?
   (b) Consider a reliable data transfer that only uses negative acknowledgments. Suppose the sender only sends data infrequently. Would a NAK-only protocol be preferable to a protocol that uses ACKs? Why? Now suppose the sender has a lot of data to send and the end-to-end connection experiences few losses. In this second case, would a NAK-only protocol be preferable to a protocol that uses ACKs? Why?

3. To connect to IIT Delhi site from MNNIT Allahabad, a machine PC11 is used. Ganesh is the local DNS server. Explain the process of resolving the name www.iitd.ernet.in from PC11 at MNNIT Allahabad. You can choose different IP addresses and names of intermediate DNS servers as follows:
   - MNNIT Allahabad DNS server name: ganesh and IP 210.213.50.11
   - IIT Delhi DNS server name: iitkdns and IP 210.214.50.11
   - Ernet DNS server name: ernetdns1 and IP 210.215.50.11
   - India DNS server name: indns1 and IP 110.120.100.5
   - Root DNS server name: root1 and IP 90.15.30.5. Any thing else if needed please assume and state clearly.

4. Consider the network shown in Figure.1.
   - Show the operation of Dijkstra's (LinkState) algorithm for computing the least cost path from E to all destinations.
   - From these results, show the least cost path from E to A, and briefly describe (in 1-2 sentence) how you got that answer from your work in part (a)

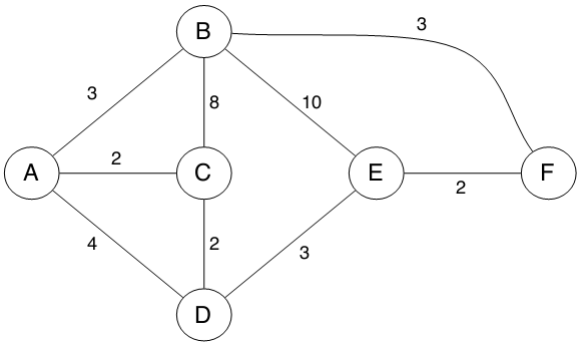

Figure 1:

- What are distance vectors in node E,D and C ? In two or three sentences, explain how least cost path from E to A is determined by E based on these three distance vectors. *Note: You do not have to run Distance Vector Algorithm. You should be able to compute distane vectors by inspection*
- Let us focus again on node E and distance vector routing. Suppose all distance vectors have been computed in all nodes and now suppose that link from E to B goes down. Approximately how many distance vector messages will be sent by node E as a result of this link going down? Explain

5. (a) Suppose there are N active peers in the Gnutella network, and each pair of peers has an active TCP connection. Suppose that these TCP connections pass through a network with a total number of M routers. How many nodes and edges are there in the corresponding overlay network?

   (b) Discuss connection establishment and termination for a TCP connection. Why transport layer uses port numbers.

   (c) Flow control often is specified in both the data link layer and the transport layer. Write the difference between these two functions.

   (d) A client C and a server S establish a connection. The MSS is 1000, and the initial sequence number is 2000 from C to S and 7500 from S to C. S has a buffer that will hold a maximum of 4000 bytes, while C's buffer will store 10000 bytes. Show the Sequence Number and Ack Number of each segment below and the Window Size as well.
   C sends SYN segment (#C1)
   S sends SYN/ACK segment (#S1) of (#C1)
   C sends ACK segment (#C2) of (#S1)
   C sends one data segment (#C3) with ack of (#S1)
   S sends ACK segment (#S2) of #C3
   C sends two more data segments (#C4 and #C5)
   S sends ACK segment (#S3) of #C4
   C sends 3 more data segments (#C6, #C7, and #C8)
   S sends ACK segment (#S4) of #C5 and #C6
   C sends FIN segment (#C9)

6. Write short technical notes on:
   (a) CSMA/CD
   (b) Fast retransmit and fast recovery in TCP
   (c) VLSM and CIDR
   (d) SMTP and POP