Department of Computer Science and Engineering
Motilal Nehru National Institute of Technology
End Semester Exam, Computer Networking(CS1503)
BTech (IT) V Semester
Time: 3 Hour, MM:60

Note: There are 6(Six) questions. 1st Question is Compulsory. Attempt any 4(Four) from the rest.

1. (20 marks) Consider the network shown in Figure.1 to answer the questions.

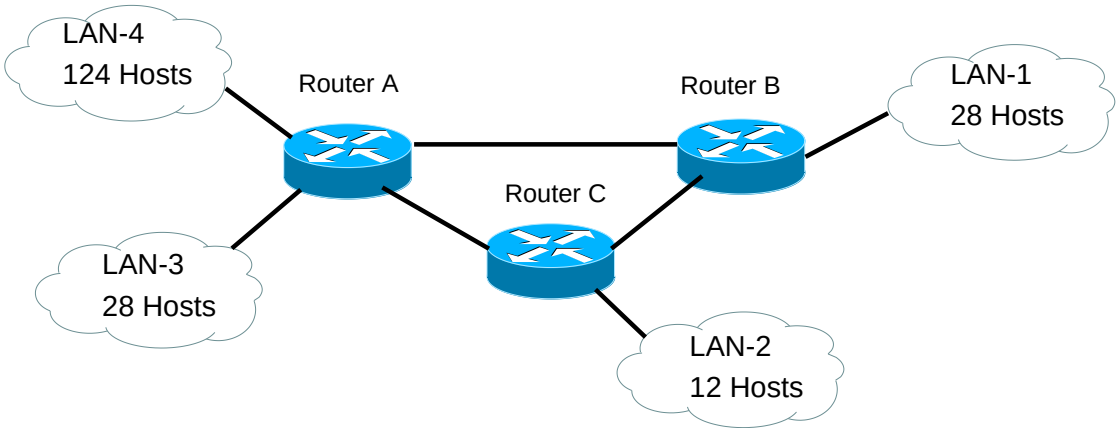

Figure 1: Network for question 1

   (a) (1 mark) How many subnets are depicted in the given network?

   (b) (5 marks) Suppose the IP addresses are to be assigned from the chunk 192.168.10.0/24 to the hosts of given network. Assign IP address ranges to all the subnets using VLSM. The wastage of IP addresses should be minimized. Also provide the address ranges which remain unassigned and can be used if future extension takes place.

   (c) (3 marks) Provide broadcast address for all the subnets. Also assign IP addresses for all the router interfaces.

   (d) (3 marks)Provide routing tables of all the routers.

   (e) (8 marks)Suppose there is a FTP server installed in one of the hosts of LAN-4. A host from LAN-2 wants to download a file from this FTP server. Explain each step clearly from initializing a FTP session to closing. Your explanation must include the role different layers of protocol stack play at different devices. You can assume that ARP caches are flushed on all devices before FTP session initiation.

2. (a) (5 marks) Assume you are administrating a private network 172.16.0.0/16, and public IP address 193.12.3.4 is assigned to you by your ISP. On your private network all hosts wish be able to access public hosts on the Internet. You therefore setup a NAT/PAT box. Assume now that two hosts 172.16.0.2 and 172.16.0.3 on your private network want to access the public web server 212.4.208.117, for example. The hosts issue an http request and the server replies with a corresponding http reply message. Which source and destination IP address and which TCP source and destination port numbers will the packets from two hosts have in the following locations: (a) When the http request is on the private network; (b) when the http request is on the Internet; (c) when the http reply from the server is on the Internet; and (d) when the http reply is on the private network.

   (b) (5 marks) This question is related to Self-learning Ethernet Switches. Suppose there is a 8-port Self-learning switch which has been just switched on. All the 8-ports are connected with different hosts. No data-transfer has taken place after switching on the switch. Now answer following questions.

i. How many fields are there in the Switch table. Name them.

ii. Suppose a host connected to port-1 of switch wants to transfer Ethernet frame to a host connected to port-8. Explain the process.

iii. Continuing from (ii.), now suppose a host connected to port-3 of switch wants to transfer Ethernet frame to host connected to port-8 of switch. Explain the process.

iv. Suppose the switch table is completely populated. Now if the hosts connected to port-4 and port-6 are swapped with each other. Explain what would happen and how switch can learn this change.

3. (10 marks) The nodes participating in the Link State algorithm in a network of 6 routers are broadcasting the link-state packets as given in Figure.2. Based on these packets, draw the network topology and assign link costs. Further, run the Link State (Dijkstra) algorithm to determine the shortest path from D to A. Show your work.

Router B		Router C		Router D		Router E		Router F	
A	4	B	3	C	3	A	5	B	6
C	3	D	3	F	5	C	2	D	5
F	6	E	2			F	8	E	8

Figure 2: Broadcasted Link-state packets

4. (10 marks) Consider a Network of three routers (A, B and C) running RIP protocol for routing. Router A is connected to B, B is connected to C and C is connected to A. The link costs between A to B is 4, B to C is 1 and C to A is 50. Currently the routing state is stabilized and routing tables are formed at all routers. Answer the following questions.

   (a) (4 marks) If the link cost of link between A and B changes from 4 to 1, outline the operations of RIP algorithm till stabilization.

   (b) (3 marks) If the link cost of link between A and B changes from 4 to 60, explain the problem faced by RIP algorithm to reach stabilization.

   (c) (3 marks) Give a solution to the problem faced in the situation depicted in (b). Show your work.

5. (10 marks) Suppose you are using TCP to transfer a 4 MB file over a network. The receiver advertises a receive window of 4 MB. Assume that the retransmission timers expire after 5 RTTs.

   (a) (3 marks) If TCP sends 4KB segments, how many RTTs does it take to send the file, assuming that there are no segment losses?

   (b) (3 marks) Describe what happens if the first segment sent after the send window reaches 1MB is lost. Assume that the version of TCP you are using does not implement fast retransmit and fast recovery. How many RTTs does it take to send the file?

   (c) (4 marks) Now assume that the version of TCP you are using implements fast retransmit and fast recovery. How many RTTs are saved by the fact that your TCP implements fast retransmit and fast recovery?

6. (10 marks) Write short technical notes on the following:

   (a) Types of Resource Records (RR) in DNS and their usage.

   (b) BGP including role of eBGP and iBGP sessions.

   (c) Strctured P2P based on DHT (Distributed Hash Table)

   (d) Hidden and Exposed Terminal problem and their solution using MACA.