Data Communication & Networks

Spring 2008 Semester

Roll Number _____

Name _____

Section _____ Signature: _____

MID II

Tuesday, 1st April 2008

Total Time: 60 Minutes
Total Marks: 40

_____

Signature of Invigilator

Course Instructors:
Engr. Shahid Qurashi, Engr. Waleed Ejaz

Q	1	2	3	4	5	6	7	Total
Marks	Zero	4	9	14	8	5	Zero	40
Obtained Marks	Zero						Zero	

You are advised to READ these notes:

1. **Attempt the paper on the question paper. NO EXTRA SHEETS will be provided. Use the back of the page if more space is required. However, no extra sheet will be checked.**
2. After asked to commence the exam, please verify that you have **eight (8) different printed pages** including this title page.
3. There are **7 questions**. Attempt all of them.
4. All questions don't carry **equal marks**. Marks for subparts are indicated.
5. **Suggested time** for each question is also indicated but this is not hard and fats, its just for your convenience.
6. Exam is closed books, closed notes. Please see that the area in your threshold is clean. You will be charged for any material which can be classified as 'helping in the paper' found near you.
7. Calculator sharing is strictly prohibited.
8. Students who attempt the paper with **lead pencils** loose the right to get them rechecked.
9. The invigilator present is not supposed to answer any questions. No one may come to your room for corrections and you are not supposed to request to call anyone. Make assumptions wherever required and clearly mark them.

Question 1 **[0]** **[Suggested Time: 4.5 min]**

Take a look at whole paper.

Question 2 **[2+2]** **[Suggested Time: 8 min]**

a. Given a data link with a sliding window ARQ protocol that uses Go Back N with a window size of 7. Host A sends four frames (D1, D2, D3 and D4) to Host B. The second frame sent to Host B arrives damaged.

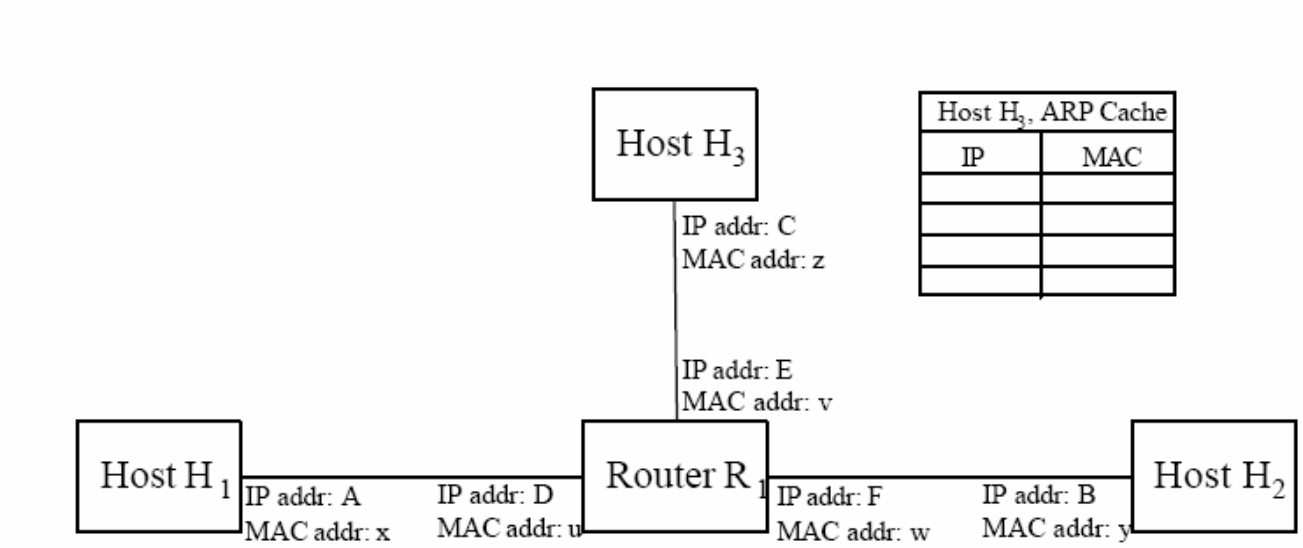
b. Given a data link with a sliding window ARQ protocol that uses Go Back N with a window size of 7. Host A sends four frames (D1, D2, D3 and D4) to Host B. Host B returns an ACK of the fourth frame sent by Host A and the ACK is lost.

In questions (a) and (b) above, identify all the events that subsequently happen at both Host A and Host B in response to the error condition. For example, identify any control messages that are sent, any frames that the Host discards and any data frames that are resent in response to a control message. Assume ACK N acknowledges frames through sequence numbers N-1.

Question 3 **[3+3+2+1]** **[Suggested Time: 14 min]**

a. The figure below illustrates three hosts H1, H2 and H3 running IPv4 over a routed network, connected by router R1. The IP and MAC addresses of the hosts and the router's interfaces are given in the figure. The ARP caches of each host and the router are shown. Assume the ARP caches are initially empty, and that no packets have been sent yet. Now, host H1 wants to send an IPv4 unicast datagram to host H2, host H2 wants to send an IPv4 unicast datagram to host H3 and host H3 wants to send an IPv4 unicast datagram to host H1.

Fill in the state of the four ARP caches as they will appear after the IPv4 unicast datagram has been delivered to host H2, H3, H1, that is after dynamic ARP resolution has been made.



Host H_3, ARP Cache	
IP	MAC

Host H_1, ARP Cache	
IP	MAC

Router R_1, ARP Cache	
IP	MAC

Host H_2, ARP Cache	
IP	MAC

b. Suppose a router has built up the routing table shown in the table below:

Subnet Number	**Subnet Mask**	**Next Hop**
67.16.120.0	255.255.252.0	Router R1
67.16.124.0	255.255.252.0	Interface A
67.16.123.64	255.255.255.192	Interface B
Default		Router R2

The router can deliver packets directly over interfaces A and B or it can forward packets to routers R1, R2. Describe what the router does with a packet addressed to each of the following destinations:

i. 67.16.123.54

ii. 67.16.123.105

iii. 67.16.128.89

c. Which fields of the IP header change when a packet passes through a router? Assume that there are no IP options and that no fragmentation occurs.

d. Why is there need for a header length field in the IP header?

Question 4 **[4+4+6] [Suggested Time: 14 min]**

a. Suppose we have the forwarding tables shown in Table below for nodes A and F, in a network where all links have cost 1. Give a diagram of the smallest network consistent with these tables.

Node A

Node	Cost	Next Hop
B	1	B
C	2	B
D	1	D
E	2	B
F	3	D

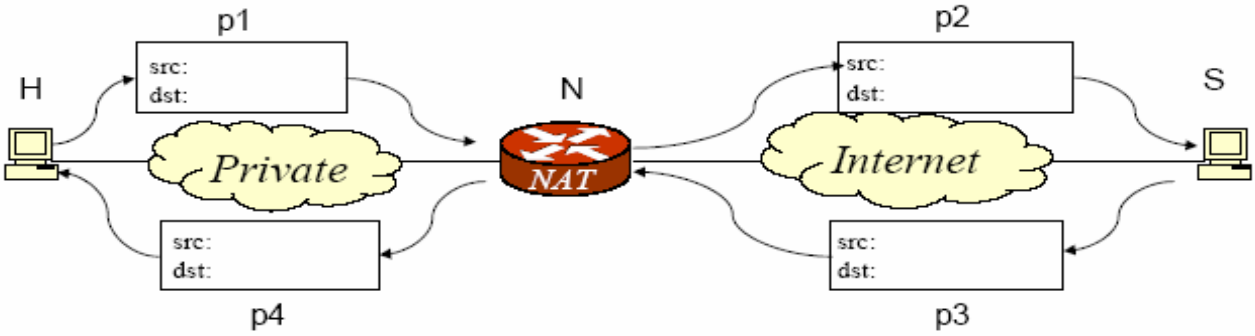
Node F

Node	Cost	Next Hop
A	3	E
B	2	C
C	1	C
D	2	E
E	1	E

Network Diagram:

b. A NAT box, N, is placed between a private and public network as shown in the figure. A host, H, on the private network with address 10.0.0.23 intends to communicate with a web server, S, on the public Internet at 123.23.4.90. The NAT box has one public address 23.1.2.3.

Fill in the source and destination address in the four positions (p1, p2, p3 and p4) as a packet is sent from the host to the web server, and the reply is sent back.



c. Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1.17.0/24. Also suppose that

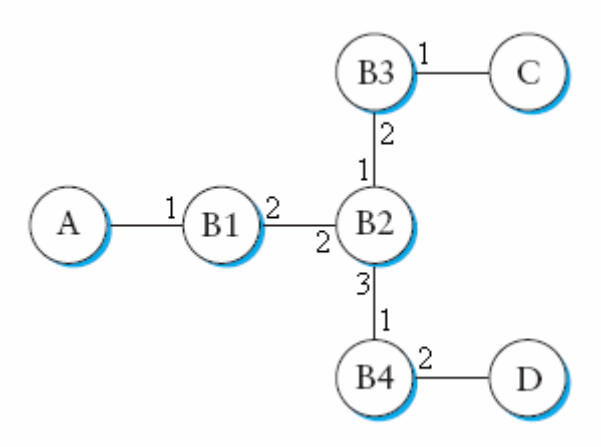
- Subnet 1 is required to support up to 125 interfaces,
- Subnet 2 is required to support up to 94 interfaces, and
- Subnet 3 is required to support up to 30 interfaces.

i. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints.

ii. If the main router receives a packet with destination id 223.1.17.228, the main router should forward that packet to which Subnet? Justify your answer, which depends on how you assigned network addresses in part (i)).

Question 5 **[4+4] [Suggested Time: 8 min]**

a. Consider the arrangement of learning bridges shown in Figure 3.38. Assuming all are initially empty, give the forwarding tables for each of the bridges B1–B4 after the following transmissions:



- A sends to C
- C sends to A
- D sends to C

B1	
Dest	Port

B2	
Dest	Port

B3	
Dest	Port

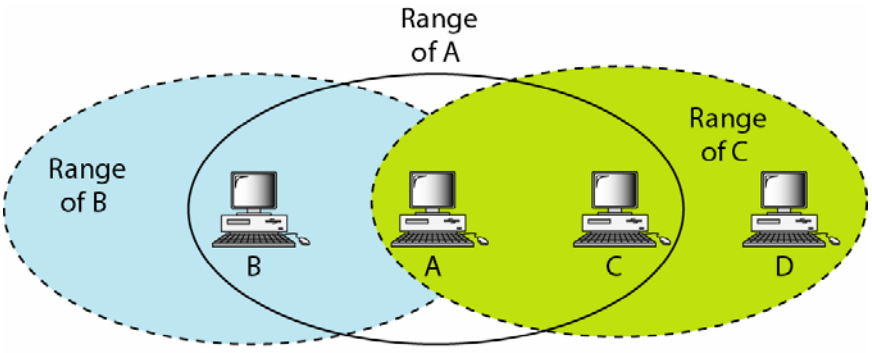
B4	
Dest	Port

b. For the figure below:

B & C are hidden to each other with respect to A

C is exposed to transmission of A & B

Identify all the other possible hidden and exposed nodes in the same way as mentioned above.

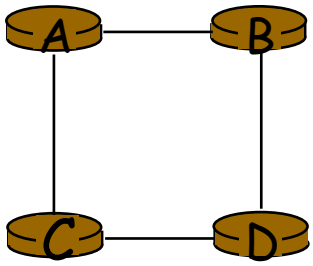


Other Possible Hidden Nodes:

Other Possible Exposed Nodes:

Question 6 **[5]** **[Suggested Time: 7 min]**

Consider the network shown below, and assume that each node initially knows the costs to each of its neighbors. Consider the distance vector algorithm and show the distance table entries at each node after each update for destination D only (i.e. omit all other destination entries form the routing tables of all routers).



Node A			
	Destination	Cost	Next Hop
Initial			
Ist update			
2nd update			
3rd update			
4th update			

Node B			
	Destination	Cost	Next Hop
Initial			
Ist update			
2nd update			
3rd update			
4th update			

Node C			
	Destination	Cost	Next Hop
Initial			
Ist update			
2nd update			
3rd update			
4th update			

Question 7 **[0]** **[Suggested Time: 4.5 min]**

Just recheck your answers.