**EAST WEST UNIVERSITY**
**Department of Computer Science and Engineering**
**B.Sc. in Computer Science and Engineering Program**
**Assignment - 2, Spring 2021 Semester**

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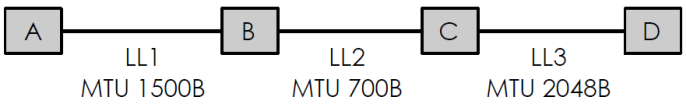
| **Course:** | **CSE 405- Computer Networks, Section-4** |
| **Instructor:** | **Dr. Maheen Islam, Associate Professor, CSE Department** |
| **Full Marks:** | **100** |
| **Submission Time:** | **May 08, 2021** |

**Question-1: [Marks 5]**
A host receives an IPv4 packet which has the offset of 200, the value of HLEN (header length) is 5, the *M* bit is 0 and the value of the tota1length field is 120.

a. What is the number of the first byte and number of the last byte in this datagram?
b. Is this the last fragment, the first fragment, or a middle fragment?

**Question-2: [Marks 15]**

IPv4 has the provision for fragmenting and reassembling packets. Consider the network in the figure below, where the MTUs of the link layers for the three IP hops is listed. These MTUs include the header of the packets. You can consider the IP packets to have no options, with a fixed header size of 20 bytes.




a. Suppose you send a packet with a payload of 1400 bytes on this network. Fill in the table below listing all the fragments that are transmitted along each link. The fields in the table (other than the 'Link' field), correspond to the values in the IP header, and we already filled in the first packet for you. (Recall that the Fragment Offset is represented as number of 8-byte increments.

| Link | Total Length | Identification | DF | MF | Fragment Offset | Time to Live |
|---|---|---|---|---|---|---|
| AB | 1420 | 45654 | 0 | 0 | 0 | 255 |
| | | | | | | |
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b. In the example above, where are fragments reassembled? Can they be reassembled anywhere else? Why or why not?

**Question-3: [Marks 10]**

An organization is granted the block 142.242.0.0/16. The administrator wants to create 512 subnets:

a. Find the subnet mask.
b. Find the number of addresses in each subnet.
c. Find the first and last allocatable addresses in subnet 1.
d. Find the first and last allocatable addresses in subnet 28.

**Question-4: [Marks 5]**

Subnet the IP Address 198.15.128.0 So that you have 10 subnets each with a maximum 25 hosts on each subnet. List the Address on host 1 on subnet 0,1,2,3,10.

**Question-5: [Marks 10]**

XYZ is an ISP company that has been granted a block of addresses starting with 155.100.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows.

a. The first group has 80 medium-size businesses; each needs 256 addresses.
b. The second group has 400 small businesses; each needs 16 addresses.
c. The third group has 2000 households; each needs 4 addresses.

Design the subblocks and give the slash notation for each subblock. Find the address of the first and last customer of each subblock. Find out how many addresses are still available after these allocations.

**Question-6: [Marks 10]**

We have 5 routers labled A-E. Suppose we have the forwarding tables shown below after the routing algorithm is stable. Let all links have cost 1.

Forwarding Table for A

| Destination | Cost | Next Hop |
|---|---|---|
| A | 0 | - |
| B | 1 | B |
| C | 2 | B |
| D | 1 | D |
| E | 2 | D |

Forwarding Table for B

| Destination | Cost | Next Hop |
|---|---|---|
| A | 1 | A |
| B | 0 | - |
| C | 1 | C |
| D | 1 | D |
| E | 1 | E |

Forwarding Table for C

| Destination | Cost | Next Hop |
|---|---|---|
| A | 2 | B |
| B | 1 | B |
| C | 0 | - |
| D | 2 | E |
| E | 1 | E |

Forwarding Table for D

| Destination | Cost | Next Hop |
|---|---|---|
| A | 1 | A |
| B | 1 | B |
| C | 2 | B |
| D | 0 | - |
| E | 1 | E |

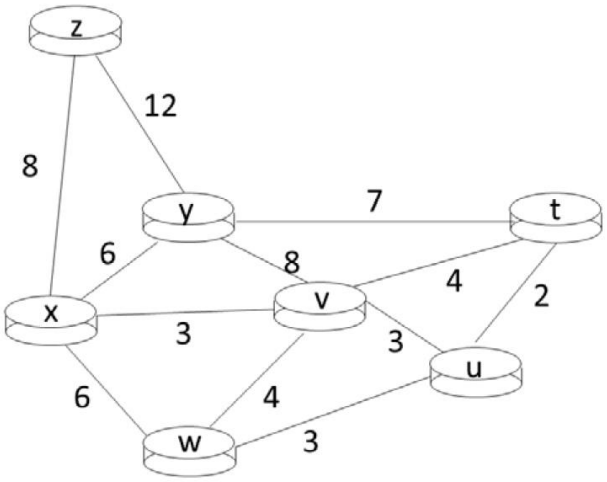
Forwarding Table for E

| Destination | Cost | Next Hop |
|---|---|---|
| A | 2 | D |
| B | 1 | B |
| C | 1 | C |
| D | 1 | D |
| E | 0 | - |

a. If a message is originated from A and a destination is E. Which path does it take?
b. If a message is originated from C and a destination is D. Which path does it take?
c. Give a diagram of a possible network consistent with these tables.

**Question-6: [Marks 15]**

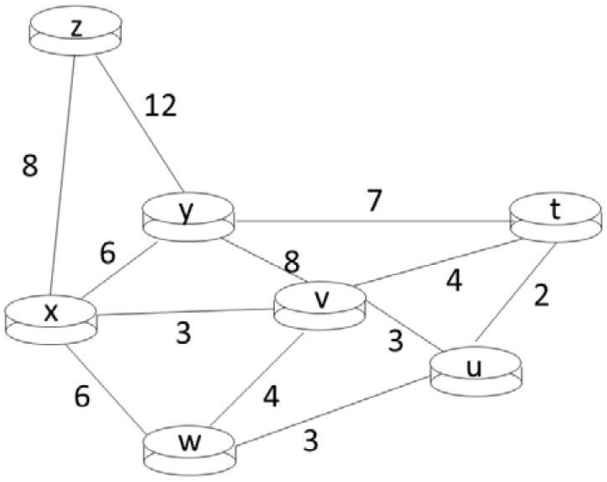
Consider the following network. Here, Distance vector routing is being used.




a. Derive the initial routing table for all the routers.
b. In the next time slot, router t receives route update from u, v and y. Compute t's new routing table.
c. In the next time slot, router u receives route update from t, v and w. Compute u's new routing table.

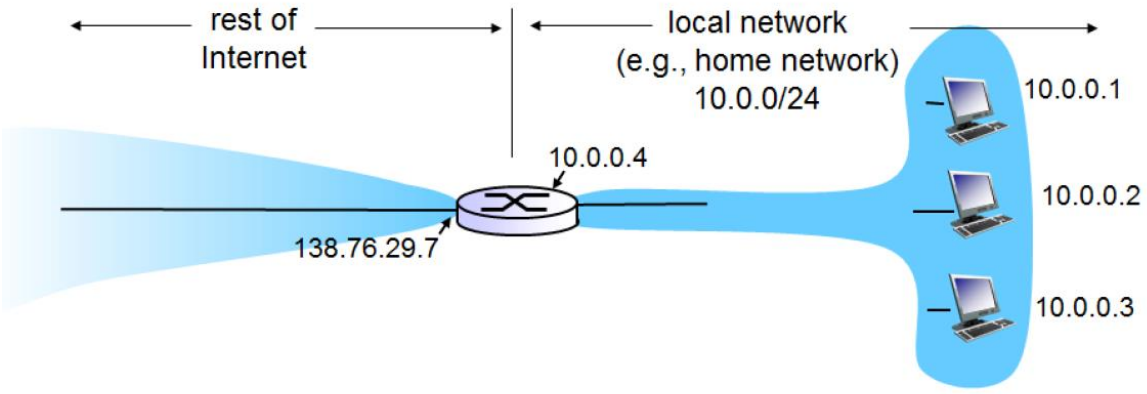
**Question-7: [Marks 15]**

Using the Dijkstra shortest-path algorithm, compute the shortest path from node u to all network nodes in the network illustrated in the figure below.



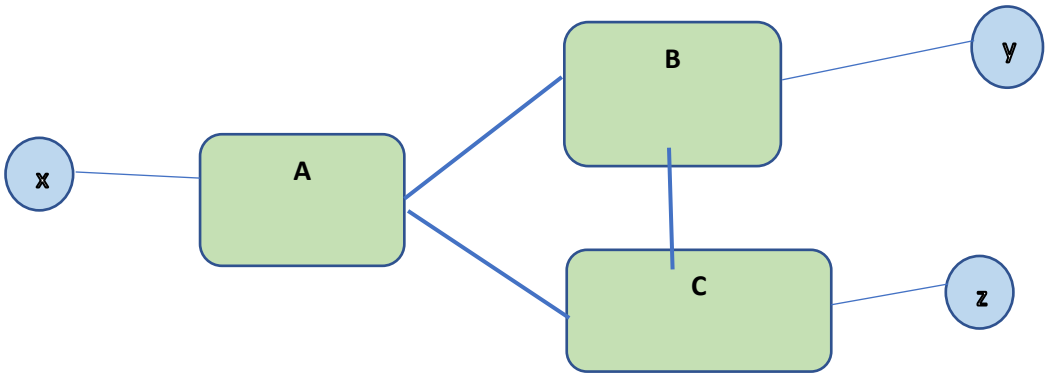

**Question-8: [Marks 5]**

In the network scenario demonstrated in the figure below, the host 10.0.0.3 sends a packet from its port 4334 to IP address 142.122.40.180 with port number 80. Assume also router uses port number 4032. Show the Source and destination IP addresses and port numbers for each step by considering NAT in the following Figure.




**Question-9: [Marks 10]**

Consider a slightly different AS-level topology running BGP routing below. Suppose x starts by announcing a path "x" for destination x to A. Upon receiving the path announcement, A learns a new path to reach x – "Ax". A updates its routing table and announces the new path "Ax" for destination x to B and C. Upon receiving the announcement, B learns a new path to reach x – "BAx" and updates its routing table.




a. What will C learn as a new path to x upon receiving the announcement from A?
b. Suppose B announces the new path for destination x to C. What will C learn as a newpath to x upon receiving the announcement from B?
c. Continue from (b). If z is C's customer and forwarding packets for z with shorter delay will satisfy z better, which path for destination x would C prefer to announce to z? And why?
d. Continue from (b). z is C's customer and C cares less of the customer's satisfaction. If B charges less per unit traffic to forward for C and A charges more, which path would C prefer to announce to z? And why?