

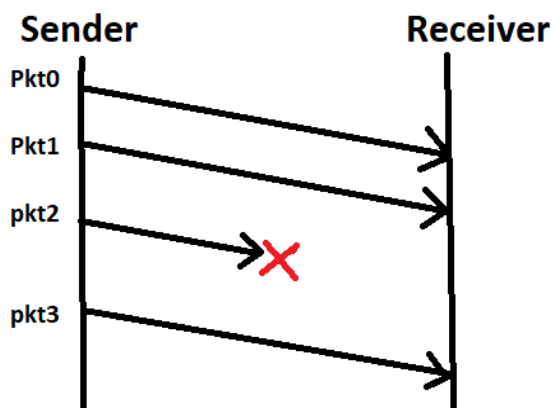


[Any examinee found adopting unfair means will be expelled from the trimester/program as per UIU disciplinary rules.]

There are 3 (Three) questions. Answer all 03 questions. All questions are of values indicated on the right-hand margin.

Q1.

- a) Suppose, a sender sends a message with the following polynomial function: $x^7+x^5+x^4+x^2+x$ and the generator polynomial is $x^4+x^3+x^2+1$.
- I. What will be the **polynomial function** of the final message? [1.5]
- II. If the **second LSB bit** gets changed during transmission, will there be any error on the receiver side? Show all calculations. [1.5]
- b) Explain the **TCP handshaking** process with proper diagrams and state changes. [2]
- c) Based on the given figure, answer the following question: [3]



With **window size, N=4**, How do the

Packet transmission and

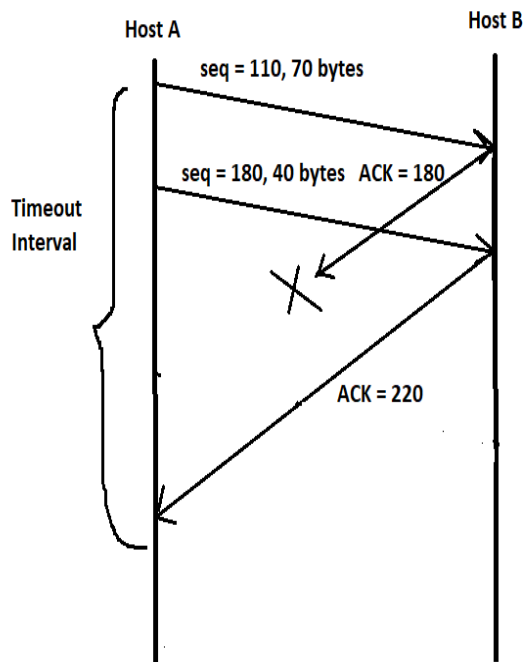
Acknowledgement vary after the loss for both the **Go-Back-N** and **Selective Repeat Protocol**?

Suppose, there are three (3) more packets in the sender side buffer.

- d) Demonstrate the TCP segment format with the aid of a diagram. [2]



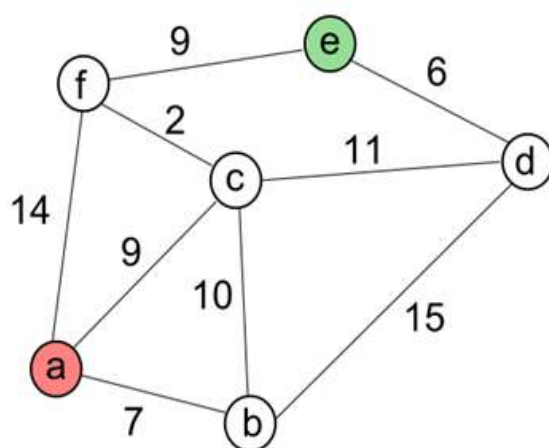
- e) Consider the following **TCP data transfer sequence diagram** and answer the questions according to it:



- I. What will be the new value of **SendBase** (Sequence number of next packet to be sent) at Host A after receiving **ACK #220**? Explain the reason. [2]
- II. What will be the change in the given sequence diagram if the **second ACK (#220)** comes after the **first timeout interval**? Draw the diagram with changes. [2]
- III. If instead of the **first ACK (#180)**, the first **data segment (SEQ #110, 70 bytes)** is lost, what will be the **ACK number** of the ACK sent by host B for the **second segment (SEQ #180, 40 bytes)** sent by Host A? [1]

Q.2

- a) Answer the following questions:
 - i. What are the three major **limitations** of **IPv4**? [1]
 - ii. Describe with diagrams how the **tunneling process** is implemented when for a particular route, **both IPv4 and IPv6 networks** are operating. [2]
 - iii. What are the **two main formats** in which **IPv6** address is represented? [1]
- b) Given a graph, $G = (N, E)$, where **N** is the set of **routers** and **E** is the set of **links**, Using **Dijkstra's link-state routing algorithm** compute the **least cost path** from **node, a** to all other nodes and show the resulting **least-cost-path tree** from 'a'. [5]





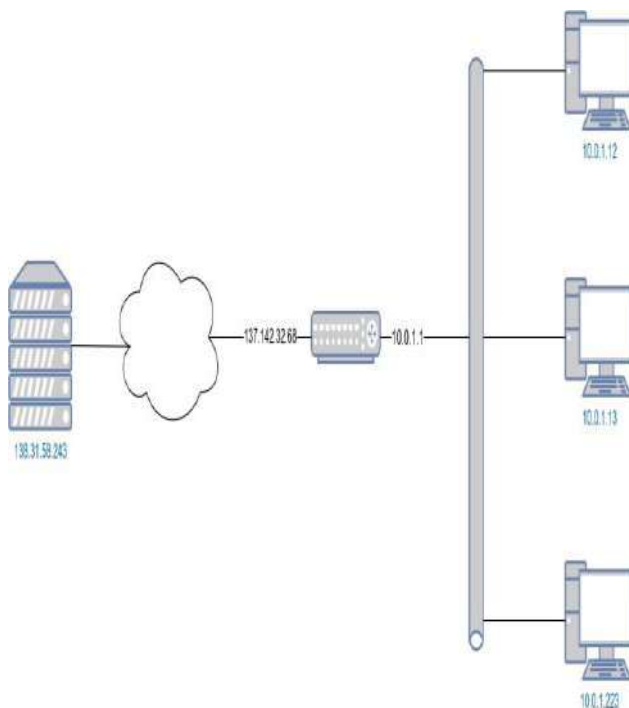
- c) Consider a **datagram** of **4,020 bytes** (20 bytes of IP header plus 4,000 bytes of IP payload) with an **ID** of 65 arrives at a router and must be forwarded to a link with an **MTU** of **600 bytes**.

Now answer the following questions:

- How many **fragments** will this datagram be divided into? [1]
- Calculate the values for the **length**, **ID**, **frag_flags** and **frag_offset** fields of the fragmented datagrams. [2]

- d) Suppose that the PC with **IP address 10.0.1.12** is trying to send a datagram from a TCP connection with **port 43455** to a process with **port 80** in the server with **IP address 138.31.58.243** in the public network.

Now answer the following questions:



- What will be the **source** and **destination** IP addresses of the datagram that is being **sent by the PC**? [1]
- What will be the **source** and **destination** IP addresses of the datagram that will be **received by the server** in the public network? [1]
- What will be the **source** and **destination** IP addresses of the datagram that contains the **response being sent by the server**? [1]
- What will be the **source** and **destination** IP address of the datagram that will be **received by the server** after conversion of IP address by the router? [1]

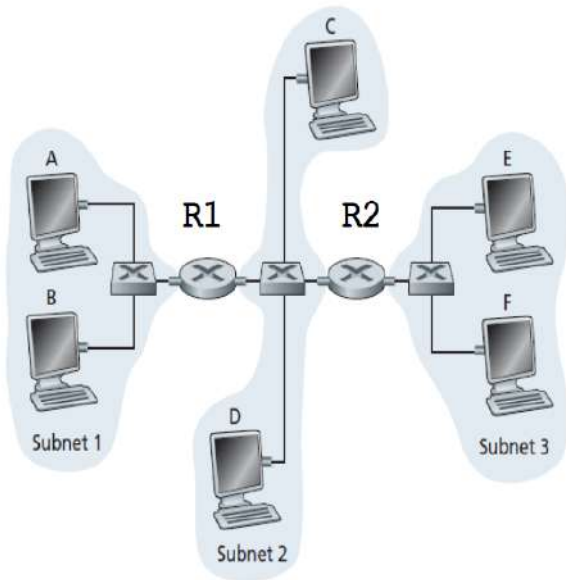
- e) Answer the following questions regarding **DHCP**:

- How does a **DHCP client** discover the **DHCP server** inside a network? [3]
- DHCP runs over which one: **TCP** or **UDP**? Justify your answer. [1]



Q.3

Consider the following diagram and answer the questions below:



a) Consider sending an IP datagram from Host C to Host D. Suppose Host C's **ARP table** is empty. What will be the **destination MAC** of the **ARP query** Host C will send? Which nodes in the network will **receive** the query? Which node(s) will **reply** to the query? [2]

b) Now, Consider PC E needs to communicate with PC A. Whose **MAC address** is needed by PC E to send data to PC A? List all the steps by PC E to send data frame to PC A. [3]
(You can consider your own MAC addresses & IP addresses for explanation).

←End of Paper – Thank You→