

**❖ Question (1): choose the correct answer and provide short reason for your answer:**

- 1) In the network layer, it follows different techniques to ensure transferring the data packets to the correct destination device and we call the process of moving packets from a router's input link to appropriate router output link is ..... While the process of deciding the best route for a packet from source to destination is called .....
  - A. navigating
  - B. routing
  - C. forwarding
  - D. switching
  
- 2) In network layers specifically in the control plane portion, we say that the algorithms implemented in routers is called .....and those that are implemented in remote servers are called .....
  - A. SDN
  - B. traditional routing algorithms
  - C. RFCs
  - D. RIP
  
- 3) The routing algorithms inside of each router mainly operates in ..... of the network layer.
  - A. Data controller
  - B. control plane
  - C. Data plane
  - D. Network controller
  
- 4) ..... The rate that determines how much faster the packets could be transferred from input ports to output ports of a router.
  - A. Switching rate
  - B. Transferring rate
  - C. bandwidth rate
  - D. transmission rate

- 5) Select the appropriate types of switching fabrics “choose all that could be correct.”
- A. interconnection network
  - B. memory
  - C. bus
  - D. switch storage
- 6) Bandwidth of a network determines how much data could be transferred at a given amount of time and this data in the form of
- A. bits
  - B. headers
  - C. data frames
  - D. data packets
- 7) Select all the appropriate packet scheduling “select possible answers”
- A. RR
  - B. WFQ
  - C. SSP
  - D. FCFS
- 8) If you are at work and connected to the private network of your organization that’s located in Cairo and you need to send an email to the other branch of the same organization in London, then your computer will deal with a public ..... address that is generated via ..... In routers when they try to send your email to London.
- A. MAC
  - B. IP
  - C. RIP
  - D. NAT
- 9) In question 8, all the devices within the organization have the same public IP addresses (True/False)  
and if it’s true provide the reason and if not then correct the answer.
- 10) The broadcasting message in routers has a time complexity of.....
- A.  $O(N^2)$
  - B.  $O(\log(n))$
  - C.  $O(N)$
  - D.  $O(2^N)$

- 11) In ..... routing algorithms, each router has a complete knowledge of the cost of network changes that happens to the other routers in the network and give an example if this type of algorithm ....?
- A. decentralized, Dijkstra
  - B. centralized, Dijkstra
  - C. Link state, Bellman ford
  - D. Distance vector, Dijkstra
- 12) In ..... network layer, the routing process is done and in ..... while in control plan, the forwarding process is done
- A. Data controller
  - B. Control plane
  - C. Data plane
  - D. Network controller
- 

❖ **Question (2): True or false and provide the reason in both cases and correction if it's false:**

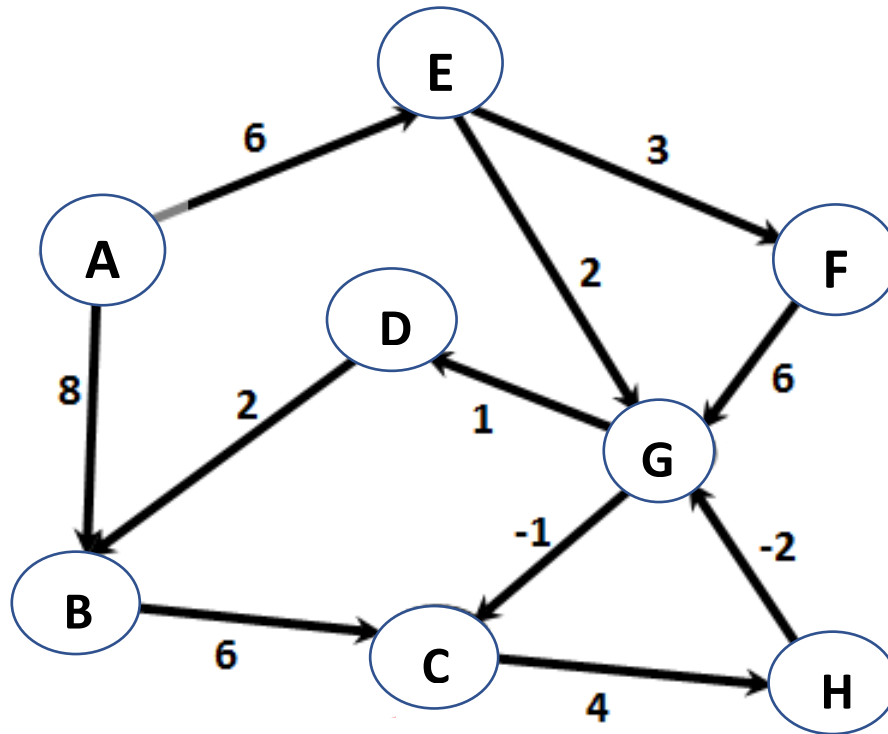
- 1) Servers is one of Network devices/Or we can say network edge devices.
  - 2) The cost of any edge on the graph representation of networks could represents the number of hops that a data packet could make until it reaches to the destination
  - 3) The link state routing algorithms could be classified under RIP.
  - 4) In the intra-AS routing approach, the AS could be your mobile device.
  - 5) In dynamic routing approach, the system administrator configures the best routes or paths between the network nodes.
  - 6) Dijkstra algorithm is a distance vector algorithm (T/F)
  - 7) The efficient Dijkstra algorithm has a time complexity of  $O(\log(n))$
  - 8)  **$D(b) = \min ( D(b), D(a) + c_{a,b} )$  is the equation for bellman ford**
  - 9)  $D_x(y) = \min_v \{ c_{x,v} + D_v(y) \}$  is the equation for Dijkstra algorithm.
  - 10) Bellman ford algorithm fails in detecting the best shortest path when the network has one -ve cost
- 

**Question (3): Answer the following questions:**

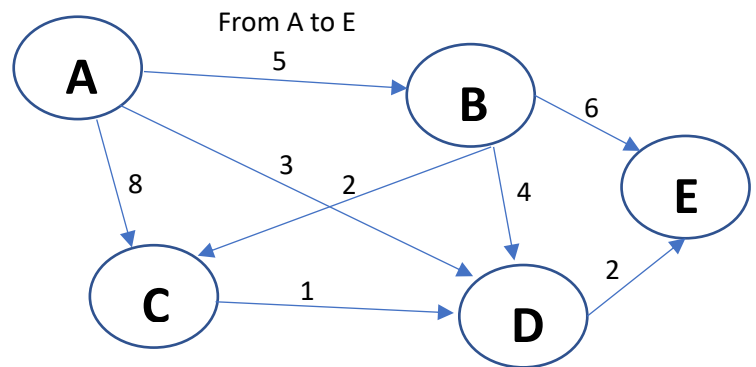
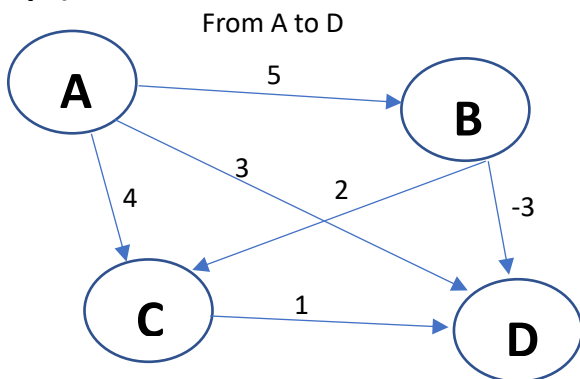
- 1) Which algorithm that causes the phenomenon of forwarding the data packet back to its source again? and why this may happen?

2) Which algorithm that causes the phenomenon of oscillating the data packet between all the routers in network? And why this happens? and what is the most proper solution that had been proposed to solve that issue or flaw?

❖ **Question (4):** Apply the suitable routing algorithm to find the best shortest routing path from router A to D (Demonstrate your answer by tables and steps)



❖ **Question (5):** Apply Dijkstra algorithm if it's possible. (Demonstrate your answer by tables and steps)



❖ **Question (6):** Write the pseudocode for (Bellman ford – Dijkstra) algorithms.

❖ **Question (7):** make a comparison between bellman ford and Dijkstra algorithm.

❖ **Question (7):** Complete the following: for a graph of  $N$  nodes and  $E$  edges

- 1) The time complexity for Dijkstra is ... and the time complexity for the enhanced version of it is... And space complexity is
- 2) The time complexity for bellman ford when it's applied on a directed incomplete connected graph is and for a complete graph is.... And space complexity is.....