

Student Number: \_\_\_\_\_

Signature: \_\_\_\_\_

Indicate which is the right statement (correct answer will give 1 point, incorrect will not count).  
The objective of this section is to ensure that some of the basic concepts of transport, link layer and application protocols are understood.

1- Transmission Delay

- a) is the time to propagate the bits from the beginning to the end of the link
- b) depends on the distance between beginning and end of the link
- c) is the time required to push all the bits into the link
- d) is the time the packet has to wait in the router before being sent to the link

2- HTTP 1.0 uses

- a) UDP as transport protocol
- b) 90 as the default port in the server for incoming connections
- c) both persistent and non persistent connections
- d) non persistent connections only

3- HTTP client uses

- a) "WWW-Authenticate" header to send user authentication info to the server
- b) "Authorization" header to send user authentication info to the server
- c) "User-Agent" header to send user authentication info to the server
- d) "Content-Disposition" header to send user authentication info to the server

4- The DNS authoritative server

- a) knows the IP addresses of all other authoritative servers for a given hostname
- b) knows the CNAME and MX information for all the hosts
- c) for a given host only store the CNAME for the given hostname
- d) for a given host is the one that always has a record that translates that host's hostname

5- UDP provides the following services to upper layers

- a) reliable transfer based on ACK messages and retransmission
- b) multiplexing and demultiplexing based on port numbers
- c) congestion control based on RTT calculations
- d) multiplexing and demultiplexing based on source and destination IP addresses

6- TCP provides the following services to upper layers

- a) only point-to-point communications
- b) non reliable transfer
- c) support for multicast communications
- d) connection-less communications

7- The MSS in TCP indicates

- a) the maximum size of the data that guarantees no fragmentation at IP layer
- b) the maximum size of application data that can be placed in a TCP segment
- c) size of TCP segment including application data and TCP headers
- d) the maximum size of the TCP buffers for the congestion window

8- The TCP sequence number is

- a) a random number selected for every TCP segment
- b) the byte number of the first byte in the TCP segment
- c) used for implementing multiplexing and demultiplexing
- d) the number selected in the receiver to indicate the bytes that it can receive

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9- The TCP SYN flag is set to 1 when

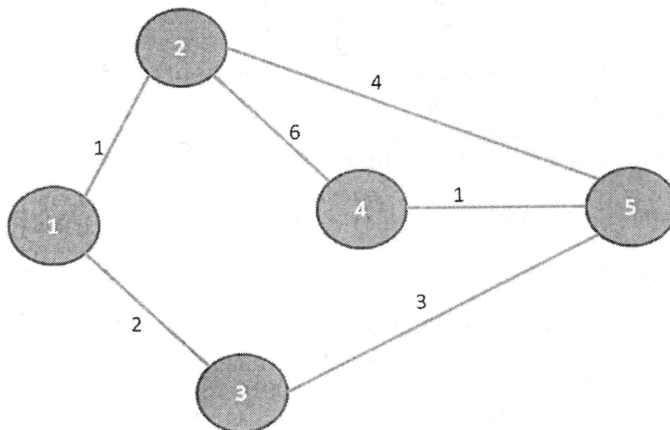
- a) client initiates the connection with the server
- b) when server sends connection-granted to the client
- c) when client initiates the connection with the server and server sends connection-granted
- d) when client initiates the connection with the server and server initiates the closing of the connection

10- The data field in Ethernet frame

- a) should be higher than 1500bytes
- b) is between 40 and 1500 bytes
- c) will be stuffed if data is less than 46 bytes
- d) is between 50 and 1500 bytes

Give the answer to the following questions (correct answer will give 2 points, incorrect will not count): The student should have deep understanding of basic IP message structure, routing algorithm and application protocol

11 – Calculate the shortest path between node 1 and node 4 using Dijkstra algorithm



13- Calculate maximum data throughput of Stop-and-wait based on the following parameters: Bitrate:  $R_b = 100\text{Mb/s}$ , I-frame size:  $L_I = 92\text{ bits}$ ; ACK-frame size:  $L_A = 8\text{ bits}$ , propagation speed:  $s = 200 \times 10^6\text{m/s}$ , assume  $T_d = 0$ , no errors occur and copper wire link:  $d = 100\text{km}$ .

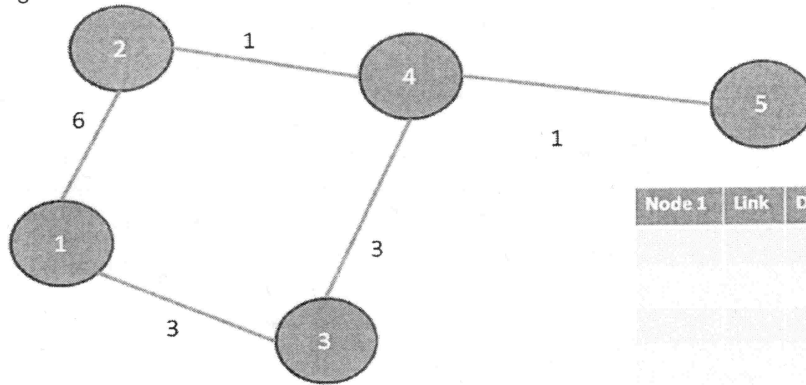
The maximum throughput can be calculated after applying the correcting factor that compare the I-frame duration to the total duration of the transmit.

$$p_s = T_I / (T_I + 2T_p + T_D + T_A)$$

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12- Fill the routing tables of each node.



Node 1	Link	Distance

Node 2	Link	Distance	Node 3	Link	Distance	Node 1	Link	Distance	Node 5	Link	Distance

14- Fill in the missing values of SYN, ACK, seq parameters when doing the TCP handshake.

