Minia University
Faculty of Engineering
Computers and Systems Engineering department

Course: Computer Networks	Code: CSE 4	Date: 06/03/2021	Final Exam	Max. Degree: 90	Time: 3 Hrs.

- **Answer the following questions.**

Question 1: - (20 Marks)

A) Define flow control and congestion control, and explain the difference between them.
B) Explain the fundamental differences between the FTP file transfer protocol and HTTP, the fundamental protocol of the Web.
C) Name one networking function that is implemented only at the application layer, one the is implemented only at the transport layer and one that is implemented only at the network layer of the Internet stack.
D) What is the 32-bit binary equivalent to the IP address 192.168.128.1?
E) Suppose Host A wants to send a large file to Host B. The path from A to B has three links, of rates R1 = 500kbps; R2 = 2Mbps, and R3 = 1Mbps

Throughput: Actual amount of data that can be pass through a connection

i) Assume no other traffic in the network, what is the throughput for the file transfer? 500 Kbps
ii) Suppose the file is 4 million bytes. Dividing the file size by the throughput, roughly how long will it take to transfer the file to Host B? 64 s

Question 2: - (20 Marks)

A) How are routing protocols used? What is the interaction with the way IP works?
B) Explain DV vs LS routing algorithms. What are the differences in terms of capabilities and complexity?
C) Consider the 6-node network as shown in figure 1, with the given link costs. Using Dijkstra's algorithm, find the least cost path from source node **u** to all other destinations.

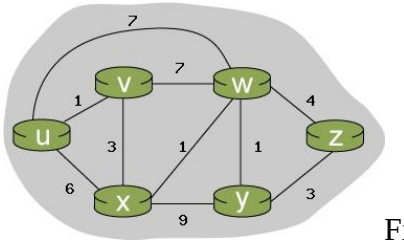

Figure 1

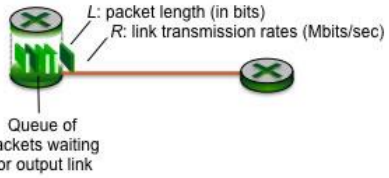

Figure 2

D) Consider the figure 2, in which a single router is transmitting packets, each of length *L* bits, over a single link with transmission rate *R* Mbps to another router at the other end of the link. Suppose that the packet length is *L*= 8000 bits, and that the link transmission rate along the link to router on the right is *R* = 100 Mbps.
(i) What is the transmission delay (the time needed to transmit all of a packet's bits into the link)?
(ii) (ii) what is the maximum number of packets per second that can be transmitted by the link?

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Question 3: - **(20 Marks)**

A) Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A.

i) In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number?

ii) If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number?

iii) If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number?

B) 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 223.1.17/24. Also suppose that Subnet 1 is required to support at least **60 interfaces**, Subnet is to support at least **90 interfaces**, and Subnet 3 is to support at least **12 interfaces**. Provide three net- work addresses (of the form **a.b.c.d/x**) that satisfy these constraints.

C) Consider sending a 2400-byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

D) Consider the network as shown in figure 3, 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 node z at the 3rd iteration of computation (The initial distance table is counted as the 1st iteration).

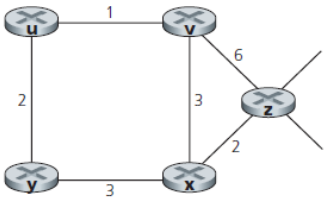

Figure 3

Question 4: - **(15 Marks)**

A) Consider a subnet with prefix 128.119.40.128/26. Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 128.119.40.64/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

B) Compare and contrast the properties of a centralized and a distributed routing algorithm. Give an example of a routing protocol that takes a centralized and a decentralized approach.

C) Why are different inter-AS and intra-AS protocols used in the Internet?

D) What is the difference between network architecture and application architecture?

The process that initiates the connection is the client. The process that waits to be contacted is the server

E) For a communication session between a pair of processes, which process is the client and which is the server?

F) Why do HTTP, SMTP, and IMAP run on top of TCP rather than on UDP?

Bwcause The applications associated with these protocol require the reliable data transfer. e.g data are required to be in order without gaps, TCP offers that but UDP do not.

Question 5: - **(15 Marks)**

A) Consider Figure 3.5. What are the source and destination port values in the segments flowing from the server back to the clients' processes? What are the IP addresses in the network-layer datagrams carrying the transport-layer segments?

B) Suppose that the UDP receiver computes the Internet checksum for the received UDP segment and finds that it matches the value carried in the checksum field. Can the receiver be absolutely certain that no bit errors have occurred? Explain.

C) In protocol rdt3.0, the ACK packets flowing from the receiver to the sender do not have sequence numbers (although they do have an ACK field that contains the sequence number of the packet they are acknowledging). Why is it that our ACK packets do not require sequence numbers?

D) What is the difference between Unicast, Multicast, Broadcast, and Anycast?

E) Consider transferring an enormous file of L bytes from Host A to Host B. Assume an MSS of 536 bytes.

   i) What is the maximum value of L such that TCP sequence numbers are not exhausted? Recall that the TCP sequence number field has 4 bytes.

   ii) For the L you obtain in (a), find how long it takes to transmit the file. Assume that a total of 66 bytes of transport, network, and data-link header are added to each segment before the resulting packet is sent out over a 155 Mbps link. Ignore flow control and congestion control so A can pump out the segments back-to-back and continuously.