EASTERN UNIVERSITY, SRI LANKA

DEPARTMENT OF MATHEMATICS

SPECIAL DEGREE EXAMINATION IN COMPUTER SCIENCE

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CS 410 ADVANCED NETWORKING TECHNOLOGIES



Answer All Questions

This paper has 4 questions in a total of 3 pages

llowed: Two Hours

) Distinguish between a *host* and an *end system*. List two types of *end systems*. [4%]

) Consider the five layer architecture of the Internet protocol stack and describe the principal responsibilities of each of these layers. [5%]

) Suppose *Host A* wants to send a large file to *Host B*. The path from *Host A* to *Host B* has three links, of rates $R_1 = 500$ kbps, $R_2 = 2$ Mbps and $R_3 = 1$ Mbps respectively.

i. By assuming there is no other traffic in the network, find out the throughput for the file transfer.

ii. Suppose the file size is 4MB. Calculate approximately how long it will take to transfer this file from *Host A* to *Host B*.

[each 2%, total of 4%

d) Suppose two hosts *Host A* and *Host B* are connected to each other by two packet switches, and a message of length $7.5 * 10^6$ bits is sent from *Host A* to *Host B*. Also suppose that each link between *Host A* and the first packet switch, between the first packet switch and the second packet switch, and between the second packet switch and *Host B* has a transmission rate of 1.5 Mbps. Ignore propagation and processing delays.

i. Consider sending the whole message without message segmentation. Find out how long it would take to move the message from *Host A* to the first packet switch. By assuming that each switch uses the store-and-forward packet switching, estimate the total time taken to move the message from *Host A* to *Host B*.

ii. Now suppose that the message is segmented in to 5,000 packets, with each packet being 1,500 bits long. Estimate how long it would take to move the first packet from *Host A* to the first switch.

iii. When the first packet is being sent from the first switch to the second switch, as in the

above case the second packet is being sent from *Host A* to the first switch. List a how long it would take to move the whole file from *Host A* to *Host B* when segm is used.

iv. Compare your results for parts i and iii, and comment on the values obtaine

[each 3%, t

2. (a) Reliable transport protocols typically use retransmission timers to decide when a pa has not been acknowledged should be resent. Outline and explain the basis on which mechanisms whereby, *Transmission Control Protocol* (TCP) computes the retran timeout value

(b) Describe two applications that are better suited for *User Datagram Protocol.*

(c) List the main fields of the *TCP* segment structure and describe their purposes in a tion oriented communication.

(d) Describe how congestion can be detected in *TCP* connections and discuss how it within *TCP* connections.

(e) Explain what types of packet losses can occur during a *TCP* connection and h communicating hosts recover in each situation.

3. (a) Discuss the necessity that forced network researchers to propose IPv6.

(b) Describe the idea of *tunneling* in the process of transitioning from IPv4 to IPv6.

(c) Describe how Network Address Translation tables assist in the management of IP ad

(d) An organization has been assigned the network number 140.25.0.0/16 and it must set of subnets that supports up to 60 hosts on each subnet.

i. Estimate the number of bits required to define the 60 hosts in each subnet, find subnet mask, show the network prefix and the extended network prefix and def of the subnet numbers.

ii. Show the subnet number of subnet 3, give three sample host addresses in subn the broadcast address of subnet 3. While answering this question you may also your mind that when subnets are formed we also want to think about future gr the network and assign bits for each subnet.

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List and describe two service models provided by the *network layer* for a flow of datagram.

Describe how forwarding tables assist in routing. Also explain how routers keep their forwarding table entries fresh.

Describe the mechanism used by the Link State Routing algorithm to prevent nodes from oscillating between paths.

Describe what is meant by *count to infinity* problem in Distance Vector Routing and explain how routers using Distance Vector routing overcome this problem.

Consider the network shown below, and assume that each node initially knows the costs of each of its neighbors. Consider the Distance-Vector routing algorithm and show the distance table entries at node *Z*.