UNIVERSITY OF SWAZILAND

FACULTY OF SCIENCE

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

SUPPLEMENTARY EXAMINATION 2011

TITLE OF PAPER: COMPUTER NETWORKS & OPEN SYSTEMS INTERCONNECTIONS

COURSE CODE : ECO 520

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS : ANSWER ANY FOUR (4) OUT OF THE FIVE QUESTIONS

EACH QUESTION CARRIES 25 MARKS

MARKS FOR DIFFERENT SECTIONS ARE SHOWN IN THE RIGHT HAND MARGIN

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QUESTION 1

(a) Briefly describe the principal function of each of the layers of the OSI reference model. (7)

(b) Explain how CSMA/CD handles medium access on a multipoint link. (3)

(c) Differentiate between circuit switching and packet switching. (4)

(d) Explain the operation of the data link layer sliding window protocol called the *Selective Repeat Protocol*. (3)

(e) Discuss the token bus network topology. (4)

(f) What is the difference between peer-to-peer and client/server communication models? (4)

QUESTION 2

(a) Sketch the Manchester encoding and the differential Manchester encoding for the bit stream : 0001010111. (Assume a 0 is represented by a low level and a 1 by a high level). (2)

(b) Two hosts separated by 3 links, each with data rate of 256 kbps, send a 250 KB file. Find the time to transfer the file between the two hosts using

(i) message switching (2)

(ii) packet switching, assuming that packets are 5000 bytes inclusive of header. (5)

(c) By using Dijksra's routing algorithm to the network of routers shown below, find the minimum distances and routes between node *A* and all other nodes. Also, sketch the graph of the routes. (12)
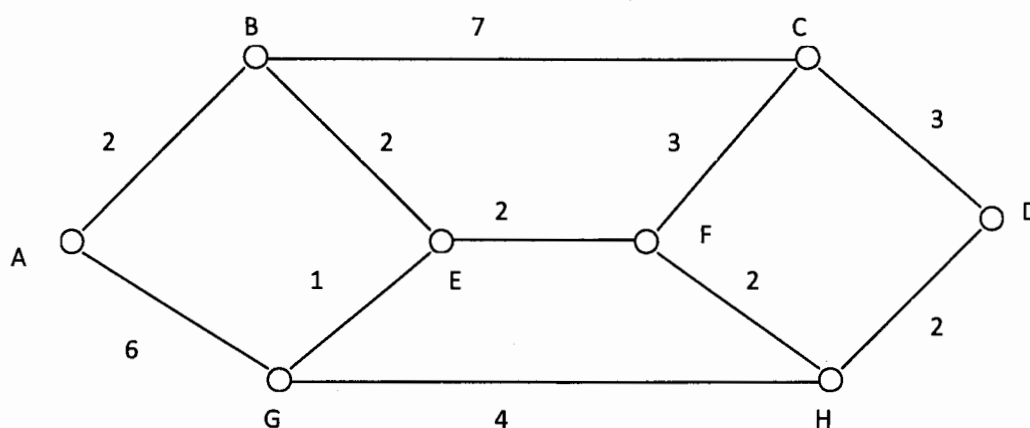
(d) Suppose an application generates chunks of 60 bytes of data every 20 ms and each chunk gets encapsulated in a TCP segment and then an IP datagram. What percentage of each datagram will be overhead and what percentage will be application data? (4)

QUESTION 3

(a) Which OSI protocol layers do the following devices belong. (3)

    (i) repeater

    (ii) switch

    (iii) router

(b) Differentiate between a repeater and a hub. (4)

(c) Explain the two main functions that are performed by a router. (4)

(d) What is the main advantage of the static routing protocol known as *flooding*? How does this protocol prevent packets from looping indefinitely? (4)

(e) What is the difference between congestion control and flow control? (4)

(f) Give any two congestion control techniques that can be applied by the network layer. (2)

(g) What is the difference between the *multiplexing* and *demultiplexing* transport layer functions? (4)

QUESTION 4

(a) Using Classless Inter-Domain Routing (CIDR), an ISP is allocated addresses starting at 200.25.10.0. Allocate network masks (prefixes) and address ranges to two of its customers, Cust-1 and Cust-2 requiring 15 and 63 host addresses, respectively. (6)

(b) Why is it said that FTP sends control information "out-of-band"? (2)

(c) Suppose Host A sends Host B a TCP segment encapsulated in an IP datagram. When Host B receives the datagram, how does the network layer in Host B know it should pass the segment (that is, the payload of the datagram) to TCP rather than to UDP or to something else? (2)

(d) Suppose datagrams are limited to 1500 bytes (including header) between source Host A and destination Host B. Assuming a 20-byte IP header, how many datagrams would be required to send an MP3 file consisting of 4 million bytes? (2)

(e)Discuss the two commonly used fundamental approaches for Data Link Layer flow control.(4)

(f) Discuss the following three variations of the CSMA protocol.

   (i) 1-persistent CSMA (3)

   (ii) Non-persistent CSMA (3)

   (iii) p-persistent CSMA (3)

QUESTION 5

(a) A pure ALOHA system uses a 56 kbps channel. On average, each terminal originates a 1024-bit packet every 30 seconds. How many terminals can the system accommodate? (4)

(b) What is the reasoning behind having a minimum frame length in the data link layer? (1)

(c) Why is *segmentation* preferably performed in the transport layer rather than in a lower layer? (2)

(d) Given that a network with IP address 150.215.17.9 is divided into a number of subnets and has the following subnet mask: 255.255.240.0. Work out the subnet address to which the IP address belongs. (3)

(e) A person on a motorbike travelling at 50 km/hr can carry 5 CDs, each CD containing 700 MB of data. For what range of distance would it be faster to use the person on the motorbike to transfer the information on 5 CDs, than to use a 1 Mbps data line to transfer the data? (4)

(f) Briefly discuss the two types of transmission technologies that are widely used in computer networking. (8)

(g) Name the three fundamental characteristics that distinguish LANs from other kinds of networks. (3)