THIS PAPER IS NOT TO BE REMOVED FROM THE EXAMINATION HALLS

UNIVERSITY OF LONDON **291 0222 ZA**

BSc Examination
for External Students

COMPUTING AND INFORMATION SYSTEMS

Data Communications and Enterprise Networking

Dateline: Wednesday 20 May 2009 : 2.30 – 5.30 pm

Duration: 3 hours

This paper is in two parts, **Part A** and **Part B**. There are total of three questions in each part. Candidates should answer **TWO** questions from **Part A** and **TWO** questions from **Part B**.

Full marks will be awarded for complete answers to a total of four questions, two from Part A and two from Part B. Each question carries 25 marks. The marks for each part of a question are indicated at the end of the part in [ ] brackets.

There are 100 marks available on this paper.

No calculators may be used.

SECTION A

Answer two questions from Section A.

Question 1

(a) State, in your answer book, which of the following statements are true and which are false and, if false, write out a corrected version of the statement:

i. The difference between packet switching and message switching is that packets have a fixed maximum size while messages do not.

ii. The main routing function within a hierarchical network resides in its core.

iii. Attenuation is caused by different frequencies being carried at slightly different speeds.

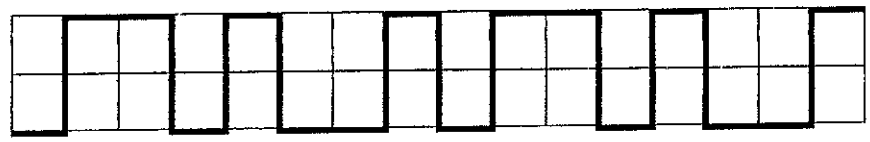
iv. A repeater is a layer 1 device while muliplexer is a layer 2 device.

[3]

(b) What numeric measure and unit do communications engineers normally use to describe the level of noise in a channel? [2]

A signal whose power is 20 mW is transmitted into a channel which is experiencing a noise level of 2μW. Calculate the numeric value that a communications engineer would use to characterise the quality of this channel [2]

(c) Write down, in your answer book, the 8 bits coded in the diagram below, assuming that they are coded using Differential Manchester encoding.



[4]

(d) Describe how the CSMA/CD access method works, explaining what each part of the acronym means. What is the main disadvantage of this method over the token passing method? [6]

(e) ASCII character codes are 8 bits long. If even parity ASCII characters are to be protected using a Hamming Code. What is the minimum number of bits that are necessary for the Hamming Code? Explain your reasoning. [1]

Show how the byte 10011101 can be encoded using an even Hamming Code. [3]

A different even Hamming Code was received as 101100011101 with one bit in error. Show how the error can be detected and corrected. What byte was originally encoded? [4]

Question 2

(a) State, in your answer book, which of the following statements are true and which are false and, if false, write out a corrected version of the statement:

i. Class A IP addresses start with a decimal number that is less than 128.
ii. IP reassembles datagrams at the destination host.
iii. TCP issues a NACK segment when it discovers a CRC error.
iv. The checksum in the UDP header protects the entire UDP datagram and part of the IP header.

[3]

(b) Outline five limitations of IP version 4 that have led to the development of IP version 6. [5]

(c) Describe how an IP router forwards a datagram to a host on a Local Area Network. [6]

(d) Outline how a switch forwards packets using virtual circuits. [4]

(e) Calculate the CRC-3 code generated for the 5-bit code 10110 using the generator 1001. [3]

A 5-bit code 01011 is received followed by the 3-bit checksum 010. Perform a CRC check on the data plus checksum using the generator 1001 and state whether there is an error or not.

[4]

Question 3

(a) State, in your answer book, which of the following statements are true and which are false and, if false, write out a corrected version of the statement:

i. The bottom layer of the Department of Defense reference model maps to the lowest three layers of the OSI reference model.

ii. The ATM Adaptation Layer has many of the functions of the transport layer, but is often treated as a data link layer protocol by IP.

iii. SMTP was designed only to carry 7-bit ASCII characters and requires an extension called IMAP to carry 8-bit data.

iv. The ITU-T's X.500 Directory Service has been adapted by Microsoft and Novell for their directory products.

[3]

(b) Describe a method whereby a web server can avoid keeping state information about its clients. [4]

(c) Describe how an application such as a browser is able to determine the IP address to which to forward a request when it is given a URL by a user. [4]

(d) List the three main international standards bodies for data communications and the type of standards they produce. [3]

List the main advantages and disadvantages of standardisation. [3]

(e) A host computer has been allocated the address 192.120.70.106 which belongs to a /21 network. What is its network address, the broadcast address for the network, the first and last usable host addresses in this range and how many host addresses does the range contain?

[8]

SECTION B

Answer two questions from Section B.

Question 4

(a) State, in your answer book, which of the following statements are true and which are false and, if false, write out a corrected version of the statement:

i. A product with a high market share and high growth is called a cash cow.
ii. SMDS is an example of a connectionless MAN.
iii. Gigabit Ethernets over fibre have to use LEDs rather than LASERs.
iv. A full duplex Ethernet provides double the capacity of a half duplex Ethernet.

[3]

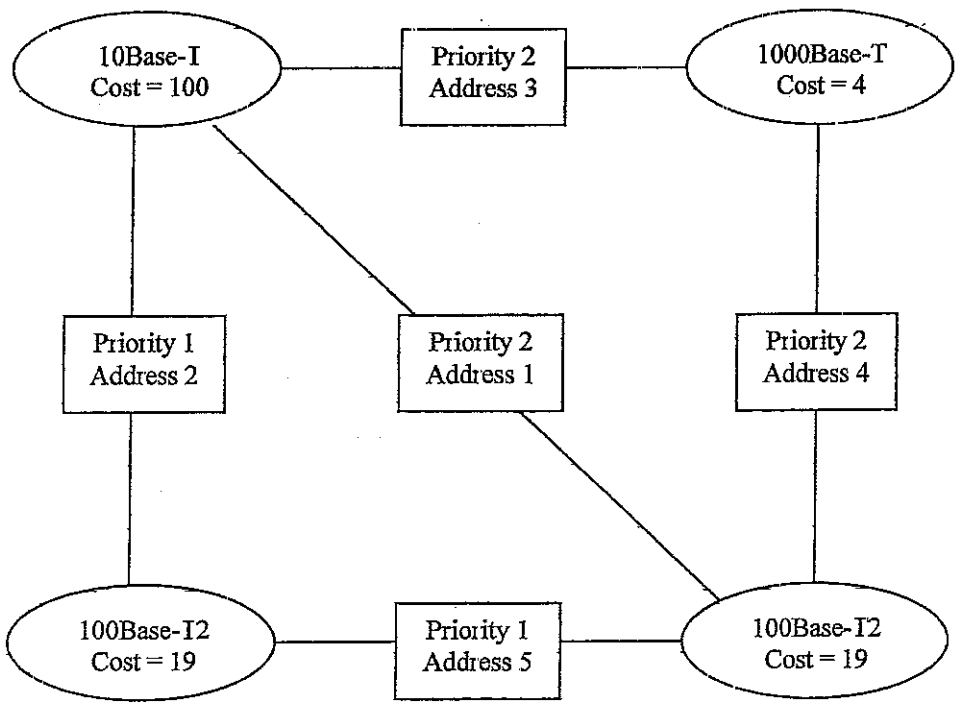
(b) List five factors that tend to increase competitive rivalry in a market. [5]

(c) What would be the standard designation of an Ethernet running at 100 Mbit/s, using four twisted pair cables as its physical medium? [3]

(d) Describe what happens when a user wants to make a call via the Public Switched Telephone network, up to the point when ring tone or engaged tone is received.

[7]

(e) Use the Spanning Tree Protocol to determine which bridge ports should be blocked in the following LAN topology. Draw this diagram in your answer book. Show which bridge is elected as the root bridge and show the path costs from each bridge port to the root bridge. Mark all the root ports with an R and all the designated ports with a D and all the blocked ports with an X. Draw the spanning tree with thick lines on the diagram. [7]



Question 5

(a) State, in your answer book, which of the following statements are true and which are false and, if false, write out a corrected version of the statement:

i. Administrative distance is the minimum number of hops from a router to its network management centre.

ii. 155 Mbit/s is the lowest data rate in common between SDH and SONET.

iii. GSM mobile phones compress voice at 13 kbit/s.

iv. An intelligent network is a network that can automatically reconfigure itself to cope with any sudden increase in traffic.

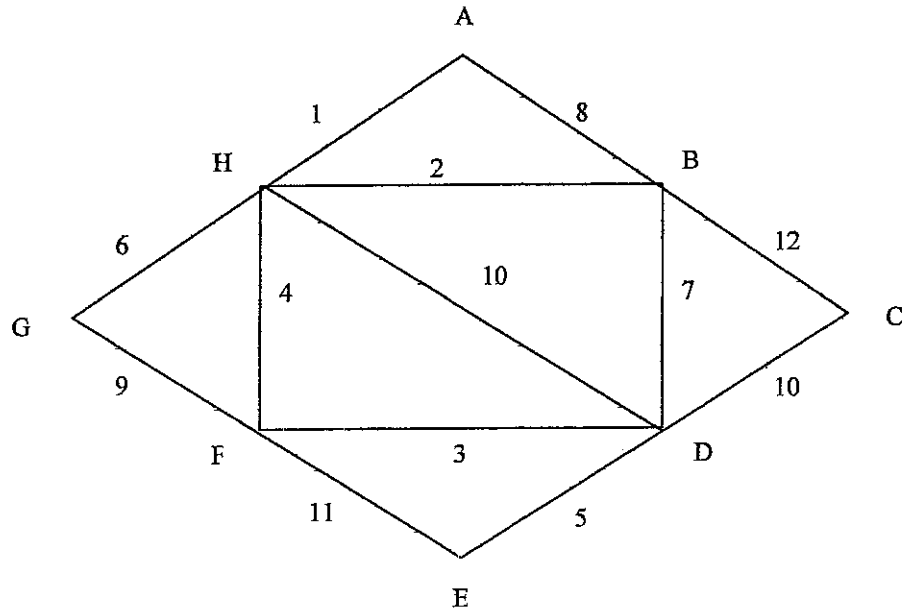
[3]

(b) List six differences between types of subnetwork that might cause problems when internetworking. [6]

(c) Indentify three reasons why it might become necessary to use bridges. [3]

(d) Describe how a transparent bridge learns to bridge frames between two LANs to which it is connected, after it is switched on. [6]

(e) Draw the network diagram below in your answer book and use Dijkstra's algorithm to calculate the shortest route between A and E, where the numbers represent distances between the nodes. On your diagram, show the node labels (including any temporary ones) you have used at each of step of the algorithm and mark the shortest path with a thick line.



[7]

Question 6

(a) State, in your answer book, which of the following statements are true and which are false and, if false, write out a corrected version of the statement:

i. Asynchronous Transfer Mode operates asynchronously at the physical layer.

ii. Diffserv redefines the Type of Service field in the IP header to support different classes of service.

iii. An autonomous system is one that is not controlled from a network management centre.

iv. Network management is regarded by ISO and the IETF as residing in the application layer.

[3]

(b) What are the three classes of multimedia applications? Provide an example application from each class. [3]

(c) List four factors that might influence the choice of media in a LAN design. [2]

(d) List eight important responsibilities of a network manager. [4]

(e) Identify four of the main sources from which network managers can collect performance statistics. [4]

(f) i. What is meant by Mean Time To Repair (MTTR) and Mean Time Between Failures (MTBF)? How are they related? [3]

ii. A communications system has an availability of 99.8%, a Mean Time to Diagnose of 1 hour, a Mean Time to Respond of 4 hours and a Mean Time Between Failure of 9,990 hours.

Calculate the MTTR and hence the Mean Time to Fix for this system. [6]

END OF EXAMINATION