UNIVERSITY OF LONDON 291 0222W

B. Sc. Examination 2006 (Western)
For External Students

COMPUTING AND INFORMATION SYSTEMS

CIS222
Data Communications and Enterprise Networking

Duration: 3 hours

Date and time: Monday 15 May 2006: 10.00 - 1.00pm

This paper is in two parts, Part A and Part B. There are a total of three questions in each part. ***You should answer two questions from Part A and two questions from Part B.*** *Your answers to Part A and Part B should be written in separate answer books.*

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 should be used.

THIS PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

UL06/699

PART A

Question 1

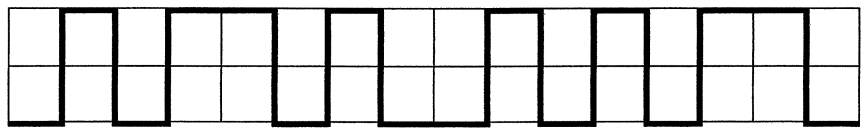
(a) State, in your answer book, whether each of the following statements is true or false and, if false, write out the correct statement:

i. Any signal can be represented by an infinite series of sine waves.
ii. Transmission delays occur because all signals take a finite time to be transmitted as their speed is limited by the speed of light.
iii. Point-to-Point Protocol is a variant of HDLC that is commonly used as a data link protocol for Internet access.
iv. Cyclical Redundancy Check (CRC) codes can be used to detect and correct single bit errors. [3]

(b) State Nyquist's theorem, defining each of the terms and giving the units in which they are usually measured. [4]

Use Nyquist's Theorem to calculate the maximum capacity of a PSTN circuit with 3.4 kHz bandwidth signal when 8 signaling levels are used. [3]

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



[4]

(d) Describe the Binary Exponential Backoff algorithm used by the Ethernet protocol. [4]

(e) Show how the byte 01101010 can be encoded using an even Hamming Code. Another even Hamming coded byte was received with one bit corrupted and the bits received were 010000101101. Show how the error can be detected and then corrected. What was the original byte transmitted? [7]

Question 2

(a) State, in your answer book, whether each of the following statements is true or false and, if false, write out the correct statement:

i. ICMP must always be implemented whenever IP is implemented and ICMP is used to report errors and to diagnose IP problems.

ii. IP Version 5 is designed to fix some of the major problems with IP version 4, such as lack of address space and security.

iii. When a UDP datagram is lost, the receiving UDP layer will detect the loss and request a re-transmission.

iv. TCP uses a three-way handshake to set up a connection between two processes. [3]

(b) Describe how an IP implementation handles a datagram whose size is too large for the network to which the datagram must be forwarded. [6]

(c) Explain why it is necessary to have a congestion control algorithm in TCP and what effect it has on the throughput of individual TCP connections. [6]

(d) Outline the main differences between connection-oriented and connectionless networks and the types of traffic that each best handle. [6]

(e) Describe the structure of the connection identifier that a TCP implementation uses to uniquely identify individual TCP connections. [4]

Question 3

(a) State, in your answer book, whether each of the following statements is true or false and, if false, write out the correct statement:

i. SMTP cannot be used to transfer binary files, unless the Multipurpose Internet Mail Extension protocol is used.

ii. The OSI Reference Model defines a protocol as a set of rules that is used between adjacent layers of the same protocol stack.

iii. FTP uses two transport connections: one for control purposes and the other for transferring data.

iv. Secure HTTP (HTTPS) uses application layer security functions to support transactions such as credit card payments. [3]

(b) Describe the main benefits of layered architectures. [3]

(c) Explain why application designers might choose to use an unreliable transport service. [8]

(d) Describe the security mechanism used by HTTP to ensure that only authorised users are able to access a web page. [5]

(e) Use the Huffman Code defined in the table below to compress the word "HOST". [3]

Using the same Huffman code, draw the Huffman Tree and use it to decode the sequence of letters represented by 0101001010010011000. [3]

A	000	N	0101
C	01000	O	011
D	01001	P	10111
F	10100	R	1001
G	10101	S	001
H	10110	T	11
L	1000	V	0101001

PART B

Question 4

(a) State, in your answer book, whether each of the following statements is true or false and, if false, write out the correct statement:

i. In a competitive market, there are usually many companies following a cost leadership strategy.

ii. 10 Gbit/s Ethernets do not suffer from any collisions as they are always configured in full duplex mode.

iii. Virtual LANs help control the effects of broadcast storms and provide greater security.

iv. IEEE 802.11 (otherwise known as Wi-Fi) can operate in full duplex mode.

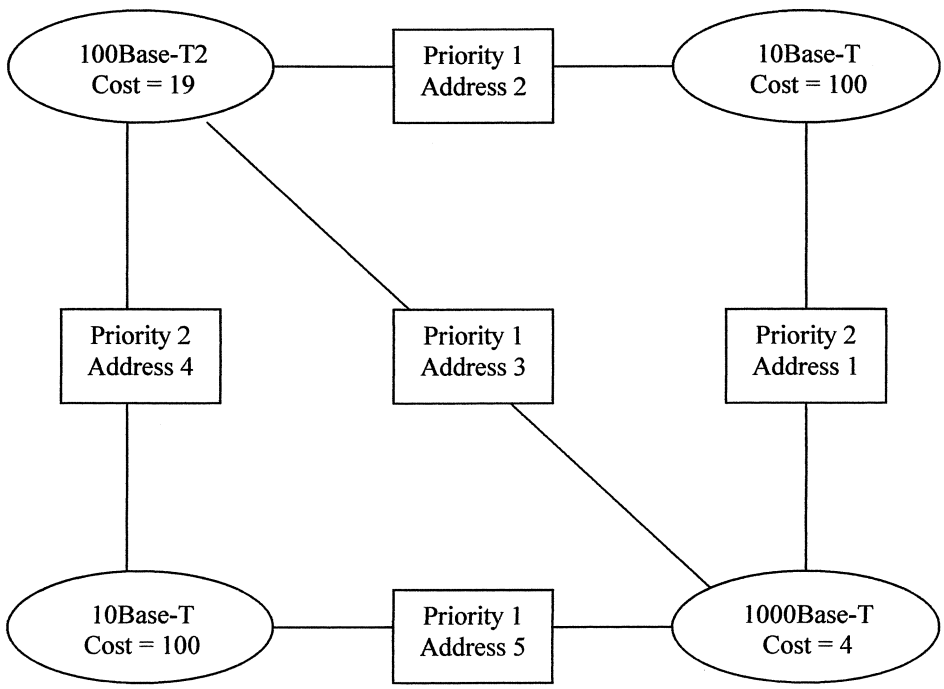
[3]

(b) Describe with the aid of diagrams, how an FDDI ring can recover from a circuit failure. [5]

(c) A type of Ethernet is described as 10Base-F. What does each of the parts of this designation describe? [3]

(d) Outline how the CSMA/CA algorithm operates, which is implemented in IEEE802.11 Wireless LANs. [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, whether each of the following statements is true or false and, if false, write out the correct statement:

i. Many cable TV networks carry voice to the home in a separate cable pair alongside the coaxial cable that delivers the TV channels.

ii. Basic Rate ISDN provides 23 or 30 B channels operating at 64 kbit/s and a D channel operating at 64 kbit/s that is used for signalling.

iii. 3G mobile phones use a combination of frequency and time division multiple access.

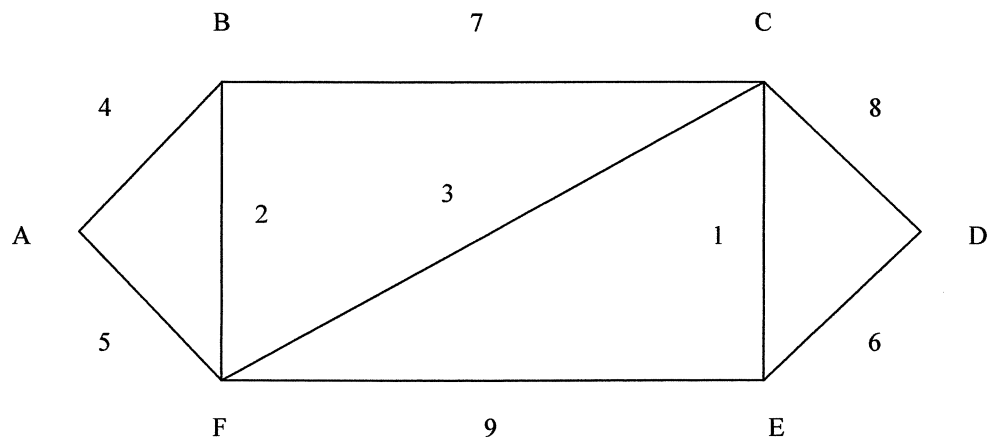
iv. The ATM Adaptation (AAL) Layer operates "end-to-end" and is in many ways similar to a transport layer. [3]

(b) Identify the reasons that Wireless Application Protocol (WAP) has not been particularly successful in Europe while iMode has been successful in Japan. [4]

(c) Identify the main differences between transparent bridges and source route bridges. [5]

(d) List five different metrics that can be used by routers to calculate shortest paths through networks. [5]

(e) Draw the network diagram below in your answer book and use Dijkstra's algorithm to calculate the shortest route between A and D, where the numbers represent distances between the nodes. On your diagram, show the node labels you have used at each of step of the algorithm and mark the shortest path with a thick line. [8]



Question 6

(a) State, in your answer book, whether each of the following statements is true or false and, if false, write out the correct statement:

i. Some protocols, such as Microsoft's NETBEUI and IBM's SNA, are not routable and must be bridged.

ii. In a private circuit network each point-to-point link should be given its own /30 subnetwork address.

iii. With SNMP, the Network Management Centre manages a centralised database of statistics and other parameters called the Management Information Base (MIB).

iv. A proxy server is an example of a network layer firewall that accesses a web server. [3]

(b) Briefly describe the four main criteria used to evaluate network designs. [4]

(c) List the advantages and disadvantages of a star network WAN design. [3]

(d) What is meant by the term Mean Time Between Failures of a network component? Describe the two methods by which a supplier can obtain the Mean Time Between Failures of its product. [4]

Two multiplexers which each have an availability of 99.8% are connected to each other by two circuits in parallel that each have an availability of 99.7%. Write down an expression for the overall availability of the communications service that is provided via the two multiplexers. [6]

(e) List five advantages that result from using a trouble ticketing system to handle faults. [5]