UNIVERSITY OF LONDON

291 0222E

B. Sc. Examination 2006 (Eastern)

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 <u>two</u> questions from Part A and <u>two</u> 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.

UL06/698

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. Noise affects all elements of Shannon's Communication Model, but the greatest effect will be on channel itself.
ii. Transmission delays results from the fact that no signals can travel faster than the speed of sound.
iii. Point-to-Point Protocol always sets the address field to the broadcast address of eight 1s.
iv. A distribution network is a network that supports end user devices and is not normally resilient. [3]

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

Explain why a 200 kHz channel will not be able to carry data at a speed higher than 2 kbit/s if the average power of the signal is 1.023 W and the average power of the noise is 1 mW. [3]

(c) Calculate the CRC-3 code generated for the 5-bit code 10100 using the generator 1001. Show how an error would be detected if the fourth bit in the 5-bit code above was corrupted. [4]

(d) Explain why there is no upper bound to the time it can take to successfully transmit a frame using the Ethernet protocol. [4]

(e) Show how the byte 01011010 can be encoded using an even Hamming Code. Another even Hamming coded byte was received with one bit corrupted and the bits received were 010101101110. 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. IGMP is an application layer protocol that is used to manage multicast groups on the Internet.

ii. IPSec is a network layer security protocol designed to work alongside IPv4 but has now been incorporated into IPv6.

iii. UDP headers contain a sequence number, which is used for error control.

iv. The TCP congestion control mechanism contributes to the variability of delays on the Internet, but is essential to its survival when traffic is very heavy. [3]

(b) Explain why it was necessary to move from classful to classless IP addresses. [6]

(c) Describe how TCP will discover that a data segment has been lost and how it will recover from the loss. [4]

(d) Outline the main differences between TCP and UDP and the types of application that they best support. [6]

(e) Describe the three different types of port numbers that are used for transport layer addressing on the Internet and how they are allocated. [6]

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. FTP uses out-of-band signalling to control the transfer of files.
ii. Service Data Units are exchanged between peer entities at the same layer.
iii. When an HTTP browser is challenged for an authentication, it will cache the username and password and will send them in subsequent requests to the server.
iv. Simple Mail Transfer Protocol is used to retrieve messages from a mail server. [3]

(b) Describe how the Domain Name System can be used to resolve a host name into an IP address. [6]

(c) Explain why application designers might choose to use an unreliable transport service. [4]

(d) Describe the limitations of the Telnet protocol for remote terminal access to hosts which might make network managers reluctant to support it and describe some ways that the limitations might be overcome. [6]

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

Using the same Huffman code, draw the Huffman Tree and use it to decode the sequence of letters represented by 1001001010100110111. [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:

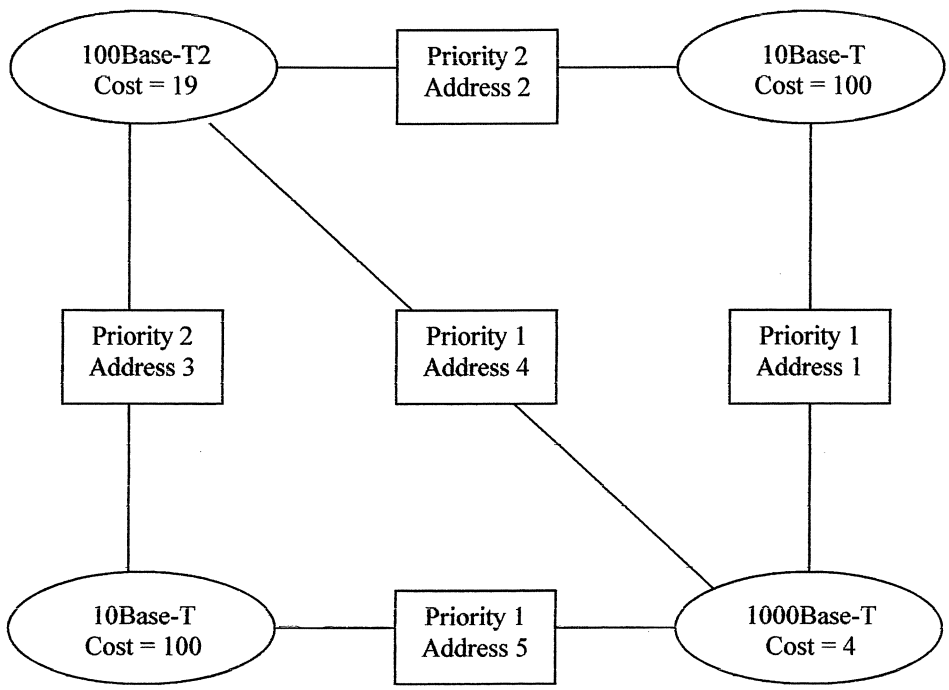
i. Bluetooth supports 48-bit MAC addresses.
ii. The IEEE802.3 protocol header has no type field and depends on sublayer protocols such as LLC for demultiplexing.
iii. The token passing access method is implemented in most Wireless LAN protocols.
iv. Selling a new product into a new market is called market development. [3]

(b) Describe how a switched Ethernet differs from a hubbed Ethernet in both its operation and performance. [6]

(c) A type of Ethernet is described as 1000Base-T. What does each of the parts of this designation describe? [3]

(d) Describe the advantages of implementing Virtual LANs. [6]

(e) Use the Spanning Tree Protocol to determine which bridge ports should be blocked in the following LAN topology. 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:

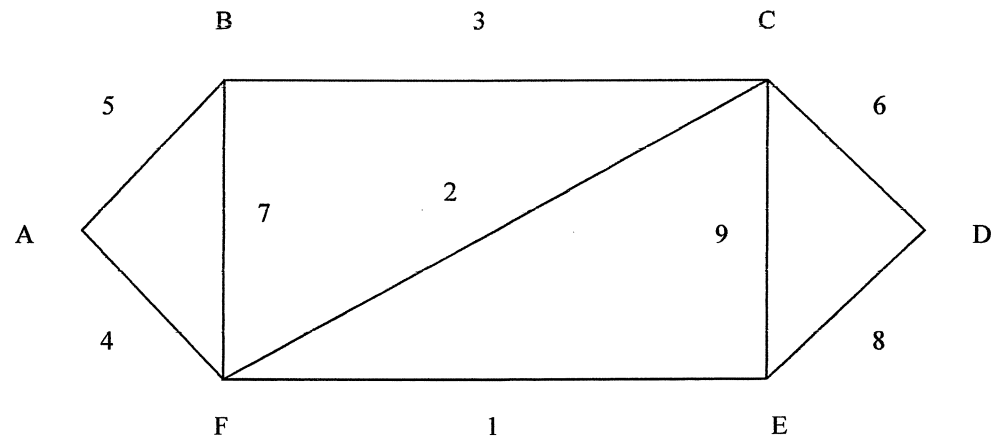
i. GSM uses a combination of frequency and code division multiplexing.
ii. Switched Multi-megabit Data Services provides a connection-oriented network service.
iii. SDH circuits are often configured in an overlapping ring topology called Shared Protection Rings (SPrings) for resilience.
iv. Most network operators carry their IP traffic over ATM networks as such networks can guarantee quality of service. [3]

(b) Describe how adaptive playout delay can be used to smooth out variations in delay when playing real-time audio or video. [5]

(c) Identify the main differences between a distance vector and a link state routing protocol. [4]

(d) Describe the circumstances in which satellite communications might provide a cost effective communications solution. Identify some of the disadvantages of such a solution. [5]

(e) Use Dijkstra's algorithm to calculate and mark the shortest route between A and D in the diagram below, where the numbers represent distances between the nodes: [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. The Routing Information Protocol is a distance vector routing protocol which uses hop count as its metric.
ii. The IP addressing scheme requires an overhaul because there are insufficient class C addresses to meet demand.
iii. A breakout box is a portable piece of test equipment that can be used to view the state of each pin on an interface.
iv. An Intruder Detection System uses infrared sensors to detect the presence of unauthorised people in a network management centre. [3]

(b) Briefly describe the four main types of requirements that should be included in a requirements analysis. [4]

(c) Identify three situations in which a wireless LAN might provide the best solution for a network within a building. [6]

(d) List four specific performance measurements, together with the normal way in which the measurement is expressed, that might be specified to evaluate how well a design meets user requirements. [4]

(e) What is meant by percentage availability, how is it related to MTBF and MTTR? [2]

A LAN has two identical routers with availabilities of 99.9% directly attached, which are each connected via separately routed circuits each with an availability of 99.8% to another pair of identical routers with an availability of 99.9% on a different LAN. Write down an expression for the overall unavailability of the communications service that is provided between the two LANs and hence calculate the overall availability of the communications service between the two LANs. [6]