ENGINEERING TRIPOS   PART IIB

Wednesday 2nd May 2007   2:30 – 4.00pm

Module 4B15

ADVANCED TELECOMMUNICATION NETWORKS

*Answer not more than **two** questions.*

All questions carry the same number of marks.

*The **approximate** percentage of marks allocated to each part of a question is indicated in the right margin.*

There are no attachments.

STATIONERY REQUIREMENTS
Single-sided script paper

SPECIAL REQUIREMENTS
Engineering Data Book
CUED approved calculator allowed

You may not start to read the questions
printed on the subsequent pages of this
question paper until instructed that you may
do so by the Invigilator

1. (a)   Explain what is meant by *connection oriented* and *connectionless* service when considering a computer network. Give an example of a type of network that uses this sort of service for each case and explain the importance of the choice of data source for the given service type.   [20%]

    (b)   Explain what is meant by the term *store and forward* switching in the context of a packet switched network such as the internet. Why is this concept important when considering quality of service in such a network compared with a traditional telecommunications network?   [20%]

    (c)   What is the function of the internet control message protocol (ICMP) and how is it implemented? Give 2 reasons why ICMP is not a very popular option for enhancing the quality of service in the internet.   [20%]

    (d)   Explain how the concept of source routing can be used to enhance network performance? Describe briefly how the route discovery process is implemented. Is this an efficient mechanism?   [20%]

    (e)   How could the concept of source routing prove to be important in modern internet quality of service protocols such as multi protocol label switching (MPLS)? Where might it be implemented?   [20%]

2   (a)   Give a brief description of how carrier sense multiple access with collision detection (CSMA/CD) works in a shared media Ethernet. What is the main advantage of this protocol?   [20%]

(b)   Why did CSMA/CD not function well as a means of accessing wireless channels in a wireless local area network? What was the solution to this problem?   [20%]

(c)   Explain what is meant by *full duplex* operation in the context of Ethernet. Why has this lead to microsegmentation and to the eventual decline of the use of CSMA/CD?   [20%]

(d)   What are the two main types of Ethernet found in computer networks? Why has Ethernet become increasing popular as a wide area network (WAN) and metropolitan area network (MAN) protocol since the loss of CSMA/CD? What is the main penalty of this evolution?   [20%]

(e)   What is meant by the term layer 4 switching? List two main features of the transmission control protocol (TCP) which can be used to enhance performance in a computer network. What effect does the use of the TCP have on the performance of Ethernet when it is used as a WAN or MAN protocol?   [20%]

3   (a)   Explain why the spanning tree protocol (STP) evolved in the context of a catenet of local areas networks (LANs) connected by layer 2 bridges. Give a simple example of when a catenet topology might require its implementation.   [20%]

(b)   When setting up the STP, what is the role of the bridge protocol data unit (BPDU)? What are the key features of its structure and how is it encapsulated within a medium access control frame? What sort of destination address is used and why?   [20%]

(c)   Using the catenet shown in Figure 1, indicate how the spanning tree would evolve. Use the diagram in Figure 1 to set up the final spanning tree (*hand it in as part of your examination script*).   [20%]

(d)   When the spanning tree has reached its steady state, explain the different states of the ports on each bridge. What is the procedure that each port follows when maintaining the steady state?   [20%]
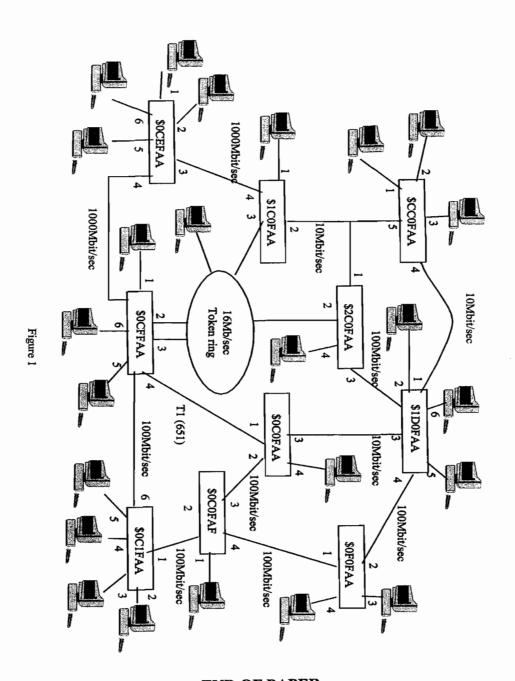
(e)   Why is the STP becoming an important algorithm in modern metropolitan and wide area networks?   [20%]

Table 5.1 Link Cost Recommendations

DATA RATE	RECOMMENDED LINK COST RANGE	RECOMMENDED LINK COST VALUE
4 Mb/s	100–1000	250
10 Mb/s	50–600	100
16 Mb/s	40–400	62
100 Mb/s	10–60	19
1 Gb/s	3–10	4
10 Gb/s	1–5	2

Figure 1

END OF PAPER