

ENGINEERING TRIPOS PART IIB

Wednesday 29 April 2009 2.30 – 4

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 why layer 2 (the data-link layer) of the open systems interconnect (OSI) model is split into two sub-layers. What is the role of each of these sub-layers? Give examples of features that might be found in each sub-layer. [25%]
- (b) One of the key features of this layer split is the addressing structure of layer 2. Explain the format of this address and why this address is such an important element in a layer 2 protocol such as would be used in a local area network (LAN). [25%]
- (c) Explain why the layer 2 address structure is also a major limitation in the scaling of LANs into metropolitan and wide area networks. Suggest two possible solutions to this scaling limitation. [25%]
- (d) Layer 2 protocols have recently been implemented across wide area connections. What sort of advantages do they offer for this application? Explain why Ethernet has become a popular choice and indicate what features have recently been implemented. Would Token Ring be a viable option? [25%]

- 2 (a) Explain why the spanning tree protocol (STP) evolved as part of the suite of layer 2 protocols used in local area networks. What general features does the STP use to fix the problems that arose from this evolution? Give an example of a potential problem scenario and show how the STP remedies this problem. [25%]
- (b) What is the role of the bridge protocol data unit (BPDU) within the STP? How is it used by designated bridges to form and then maintain the spanning tree? [25%]
- (c) How is a designated port selected via the STP? Explain the basic state machine implemented by the STP to select and maintain designated ports. Why is the timing of this state machine important in the stability of the spanning tree? [25%]
- (d) Give three examples of other network protocols that also use the spanning tree. Explain briefly why the spanning tree is used in each example. [25%]

(TURN OVER

- 3 (a) There are two main networking strategies used to control the transmission and direction of packets across a subnetwork: source routing and internet routing. Explain how each strategy works and identify the key advantages and disadvantages of each. How does the routing table of each strategy differ? [25%]
- (b) There are two main classes of internet routing. Identify each one and explain the limitations of each. Give an example of a typical subnet where each class might be implemented. [25%]
- (c) Adaptive routing has evolved over the past decades into algorithms such as distance vector routing. A fundamental limitation of the distance vector routing algorithm is the infinity problem. Give an example of a subnetwork that illustrates this problem and show how link state routing eliminated this problem. [25%]
- (d) Multi protocol label switching (MPLS) and tag switching are examples of the next generation of internetwork protocols. Explain briefly how they work and describe how link state routing can be used in this process. Could source routing ideas be adapted for use with MPLS? Suggest how this might be implemented. [25%]

END OF PAPER