ENGINEERING TRIPOS PART IIB

Wednesday 4 May 2011 2.30 to 4.00pm

Paper 4B15

ADVANCED TELECOMMUNICATIONS 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) Describe the functionality of a bridge and a router when interconnecting local area network (LAN) structures. Explain the relative advantages and disadvantages of each type of interconnection device in the context of forming a globally interconnected network. [25%]

(b) Explain the process of aging in a LAN bridge address table. Why is it an important process in maintaining LAN interconnections? Does a router address table undergo a similar process? [25%]

(c) Describe a scenario where accelerated address table aging is required in a LAN bridge. Include in your description possible mechanisms for how such a process could be managed and maintained. [25%]

(d) Explain the role of an address table in source routing when interconnecting LAN structures. Do you think that address table entries in a source routed network need to undergo an aging process? Explain your answer. [25%]

2 (a) Explain what is meant by the term 'source routed' when used in a local area network (LAN). Explain how source routed frames are indicated and what the three main frame types are. [25%]

(b) Describe, with the aid of diagrams, two possible processes of route discovery when setting up a source routed connection. What are the advantages and disadvantages of each technique? How is the optimal route selected? [25%]

(c) Describe three potential problems which may occur in the process of route discovery, when setting up a source routed connection. In each case, explain how these problems might be overcome. [25%]

(d) A source routed token ring LAN is to be connected to a carrier sense multiple access with collision detection LAN using a suitable bridge. Describe a possible means by which such an interconnection may occur and identify any potential problems. [25%]

3 (a) Explain what is meant by the terms *wirespeed* and *full duplex* in the context of an Ethernet based local area network (LAN). How have these two concepts radically changed the way in which LAN protocols operate at layer 2? Use a sketch to show how this development has changed the topology of Ethernet LANs. [25%]

(b) Sketch a diagram showing how the two concepts in part (a) can be used to perform link aggregation. Why is this a useful feature when considering interconnection in a LAN? Suggest two ways in which link aggregation can be implemented without breaking the layer 2 hard invariants. How are medium access control (MAC) addresses managed during the process of link aggregation? [25%]

(c) Explain how a simple form of flow control can be implemented at layer 2 by using the medium access control (MAC) protocol to compensate for congestion. How does this technique compare with flow control implemented in the higher layer transport control protocol (TCP)? [25%]

(d) Link aggregation is normally implemented at the layer 2 level. How could it be implemented at layer 3? Is this really a useful mechanism for enhancing the throughput of a link, or does the added complexity of the layer 3 processing negate any serious benefit from the aggregation? [25%]

END OF PAPER