UNIVERSITY OF EDINBURGH

FACULTY OF SCIENCE AND ENGINEERING

MASTER OF SCIENCE IN COMPUTER SCIENCE

COMPUTER COMMUNICATIONS

Monday 23 April 2001

14:00 to 15:30

Examiners:

I. Watson (External)

R.N. Ibbett (Chairman)

INSTRUCTIONS TO CANDIDATES

Answer any TWO questions.

All questions carry equal weight.

1. (a) Consider the problem of routing messages through a message switching network. Describe the features that routing strategies might have to exhibit, indicating how these features relate to operational requirements. [*7 marks*]

   (b) Two possible approaches to sharing network status information are, respectively:

   - *distance vector*: switches exchange their entire routing tables with their immediate neighbours in the network; and
   - *link state*: switches broadcast (to all computers in the network) information about the current quality of their links to immediate neighbours.

   Explain how these schemes can form the basis of adaptive routing strategies, and compare and contrast their usefulness in satisfying potential operational reqirements. [*8 marks*]

   (c) Suppose that two message switching neworks are to be connected together to form a simple inter-network, the connection being made via a single computer that has a link to each network. One network offers a connection-oriented service that delivers short fixed-length messages with pre-determined guarantees on delivery time and message loss rate for any connection. The other network offers a connectionless service that delivers messages of any size up to 8192 bytes on a 'best effort' basis. Discuss two possible types of service that the inter-network might sensibly provide, describing the work that the intermediate computer will have to do in each case, and stating any assumptions that you make. [*10 marks*]

2. (a) Describe the structure and operation of a CSMA/CD contention bus ('ethernet') local area network (LAN). [*10 marks*]

   (b) Consider a group of supermarkets with 23 branches throughout the United Kingdom, with each branch having a CSMA/CD LAN for its internal communications. Discuss the inter-networking problems involved in creating an illusion that all of the group's computers are on a single ethernet-style network, and suggest possible solutions. [*10 marks*]

   (c) Explain why ethernet might be the chosen type of network to form an office LAN whereas a token bus LAN might be more suitable in a manufacturing automation environment. [*5 marks*]

3. (a) Describe the structure of the ISO Reference Model for Open Systems Interconnection (RM/OSI), and give a brief description of the role of each layer in the model. [*12 marks*]

(b) The MAP stack of protocols relates closely to the layers of the RM/OSI model. Explain why this is so, and how MAP fits into the layers of the RM/OSI model. [*5 marks*]

(c) Consider the problem of reliably and securely transmitting a computer file from a large computer in the British Geological Survey, here at Kings Buildings, to a personal computer controlled field station in the Australian outback. Discuss how the communication protocol functions required might fit into the layers of the ISO model. [*8 marks*]