UNIVERSITY OF EDINBURGH

FACULTY OF SCIENCE AND ENGINEERING

MASTER OF SCIENCE IN COMPUTER SCIENCE

COMPUTER COMMUNICATIONS

Tuesday 25 April 2000

4:00 to 5:30

Examiners:

I. Watson (External)

R.N. Ibbett (Chairman)

INSTRUCTIONS TO CANDIDATES

Answer any TWO questions.

All questions carry equal weight.

1. (a) Cyclic Redundancy Codes (CRCs) are often used for error *detection* when information is sent over an unreliable channel. Explain how CRCs work, and discuss why CRCs are normally only used at the lower (i.e., more physical) layers of communication. [*12 marks*]

   (b) Outline the types of channel error that can be detected using CRCs, and comment on how a communication system using CRCs might typically implement error *correction*. [*6 marks*]

   (c) In the Internet, error correction (if performed at all) is done end to end, i.e., between pairs of computers connected by the inter-network. Discuss the merits of this approach, compared with one that is based on providing error-free physical channels inside, and between, networks. [*7 marks*]

2. (a) Ethernet-style networks may be described as 'CSMA/CD' — Carrier Sense, Multiple Access, with Collision Detection. Explain carefully what these terms mean, and how these features contribute to the network's operation. [*8 marks*]

   (b) Suppose that you are a consultant who advises clients on the pros and cons of installing ethernet-style networks to replace existing local area networks. Explain how you would advise:

      i. a bank that has a large number of token ring networks; and
      ii. a car manufacturer that has one large, and several small, token-bus networks. [*10 marks*]

   (c) Discuss the relationship between the protocol stacks used on local area networks, and the structure offered by the ISO Reference Model for Open Systems Interconnection. [*7 marks*]

3. (a) In most wide area networks, each computer is directly connected to only a few of the other computers. Discuss properties that may be desirable for the service delivered by the routing mechanism in a switching network that enables the transfer of information between any pair of computers in the network. [*8 marks*]

(b) Describe four substantially different routing strategies for switching networks, and indicate the extent to which each delivers the various properties that you have deemed to be desirable above. [*12 marks*]

(c) Suggest one way in which part of the switching network might become deadlocked, and outline a policy that would prevent this happening. [*5 marks*]