UNIVERSITY OF EDINBURGH

FACULTY OF SCIENCE AND ENGINEERING

COMPUTER SCIENCE THREE

COMPUTER COMMUNICATIONS

Friday 8 June 2001

09:30 to 11:00

Examiners:

K. Turner (External)

G. Plotkin (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) Describe the overall structure of the ISO Reference Model for Open Systems Interconnection (RM/OSI), including a brief outline of the role and the present-day relevance of each layer in the model. [*12 marks*]

(b) Outline the main aims of the Manufacturing Automation Protocol (MAP) project initiated by General Motors and its suppliers. [*4 marks*]

(c) Explain the relationship between the components of the MAP protocol stack and the OSI model. [*9 marks*]

3. (a) Describe the structure and operation of a *token ring* local area network (LAN). Comment on the main differences between an IEEE 802.5 standard token ring LAN and a Fibre Distributed Data Interface (FDDI) metropolitan area network. [*10 marks*]

   (b) Consider a token ring LAN located in a bank branch in a small town in a rural area, and another token ring LAN located in the bank's main computer centre in a large city 150 miles away. Discuss the problems involved in creating the illusion that all of the computers on the two LANs are on a single network, i.e., any computer can connect directly with any other. Suggest possible solutions to these problems. [*10 marks*]

   (c) Discuss reasons why token ring LANs are often found in banks, whereas contention bus (ethernet-style) LANs are found in many other office evironments. [*5 marks*]