UNIVERSITY OF EDINBURGH

FACULTY OF SCIENCE AND ENGINEERING

M.Sc./DIPLOMA IN ARTIFICIAL INTELLIGENCE
M.Sc./DIPLOMA IN COGNITIVE SCIENCE
M.Sc./DIPLOMA IN COMPUTER SCIENCE
M.Sc./DIPLOMA IN INFORMATICS

COMPUTER COMMUNICATIONS

Friday 26 April 2002

14:00 to 15:30

Examiners:
N. Chater (External)
N. Jennings (External)
E. Hancock (External)
K. Hawick (External)
R.N. Ibbett (Convener)
J. Oberlander (Co-Convener)

INSTRUCTIONS TO CANDIDATES

Answer any TWO questions.

All questions carry equal weight.

1. (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 Manufacturing Automation Protocol (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) Outline how the overall operation and use of a TCP/IP inter-network might be viewed in terms of the RM/OSI model. [*8 marks*]

2. (a) Consider the following three phenomena relating to absolute time:

    i. synchronous bit transmission;
    ii. timeouts on acknowledgements; and
    iii. message expiry times.

    For each, give examples of usage in computer communications, indicating how the absolute time periods are measured. [*12 marks*]

   (b) Explain how a sliding window flow control mechanism works, and how the choice of window size depends on absolute round-trip times. [*6 marks*]

   (c) A multi-national company has one computer that has direct access to a device that provides the current time of day to microsecond accuracy. Discuss how the company might implement a service that makes an accurate time of day available to all computers attached to its company-wide inter-network. [*7 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, and suggest possible solutions to these problems. [*10 marks*]

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