THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION
Diploma

COMPUTER NETWORKS

29th April 2002, 10.00 a.m.-12.00 p.m.
Answer FOUR questions out of SIX. All questions carry equal marks.
Time: TWO hours.

*The marks given in brackets are **indicative** of the weight given to each part of the question.*

1. *a)* Explain in detail, using diagrams as appropriate, why the minimum packet size for IEEE 802.3 is set at 64 bytes. **(8 marks)**

   b) "Ethernet is not suited to being used in a real time environment". Do you agree with this statement? Give your reasons. **(5 marks)**

   c) What advantages are there in IEEE 802.3 adopting Manchester encoding rather than straightforward binary encoding? **(5 marks)**

   d) As IEEE 802.3 based network speeds increase, either the minimum frame size must be increased, or the maximum length of cable must decrease. Why is this the case? If we want to keep a minimum frame size of 64 bytes, what would be the maximum permissible length of cable if the transmission speed is 100Mbps? **(7 marks)**

2. *a)* Explain the role of ARP and, using examples as appropriate, give a summary of its operation. **(10 marks)**

   b) Explain, using the IP address "192.33.45.104", how a subnet mask is used to extract the network number and the host number. **(5 marks)**

   c) Outline the essential features of the algorithm used by IP based networks to route packets to their destination. **(10 marks)**

3. *a)* Describe the sub-layers found in the OSI Network layer and explain the need for them. **(6 marks)**

   b) What is the role of the LLC and MAC layers in the IEEE architecture? How do these layers compare with those in the ISO OSI 7 Layer Reference Model? **(6 marks)**

   c) Suggest a way in which a connectionless transport layer service could be provided over a virtual circuit network layer.

   Describe how your approach affects the volume of traffic over the network. Suggest a way in which the volume of control data may be reduced. **(6 marks)**

   d) *Routers, bridges* and *repeaters* are used to connect differing networks. Under what circumstances would each of these technologies be used? **(5 marks)**

   e) Explain the difference between flow control and congestion control. **(2 marks)**

4. *a)* Explain how the quality of a transmission is affected by physical considerations. **(4 marks)**

b) Describe the differences between asynchronous and synchronous transmission. **(4 marks)**

c) Describe THREE different techniques by which frame boundaries may be encoded within a transmitted bit stream.

Explain *character stuffing* and state which technique it is associated with and why it is needed. **(9 marks)**

d) Under what circumstances would you expect pipelining to improve data link layer protocol throughput? **(4 marks)**

e) Briefly describe how:

  i) Negative Acknowledgement
  ii) Piggy-back Acknowledgement

may be used to enhance the performance of data link protocols. **(4 marks)**

5. Two minicomputers, running multi-tasking operating systems, are connected via an Ethernet local area network, with a 10Mbps capacity. A task in one computer performs a request-reply message transaction on a server task in the other computer.

a) Discuss the factors which affect the transaction response time. **(10 marks)**

b) Identify and explain which overheads affect data throughput between remote tasks. **(15 marks)**

6. *a)* How many bits can occupy a 1000-metre Token Ring, operating at 4Mbps, containing:

  i) 2 equally-spaced stations?
  ii) 100 equally-spaced stations?

You should assume a propagation speed of 200m/μsec. **(10 marks)**

b) Explain the role of each field within the AC byte of an IEEE 802.5 control token. **(8 marks)**

c) Explain how transmitting and receiving stations on a Token Ring network make use of the FS byte within an information frame. **(7 marks)**