THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATIONS
Diploma

COMPUTER NETWORKS

28th April 2006, 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. By considering any data-link layer communications protocol based on HDLC that uses a sliding window error recovery mechanism, explain the function of the following:

    i)   The response window size (W)
    ii) The send sequence number N(S) contained within each Information (I) PDU
    iii) The Poll/Final bit (P/F)
    iv) A Receive Ready (RR) PDU
    v)   A Receive Not Ready (RNR) PDU   **(5 x 5 marks)**

2. *a)* With reference to IP addressing, what is the purpose of a subnet mask?   **(5 marks)**

    b) An organisation has been assigned a Class C IP address (200.253.67.0) for its local area network (LAN). If the network administrator has assigned a subnet mask of 255.255.255.240, how many sub-networks have been defined?   **(8 marks)**

    c) Two computers on this LAN wish to communicate with each other. If they know each other's IP address, explain how the Address Resolution Protocol (ARP) is used to allow them to obtain each other's MAC addresses.   **(12 marks)**

3. *a)* A computer network operates using IP as its Network Layer protocol. Explain how the quality of service offered by IP is enhanced by the following Transport Layer protocols:

    i)   UDP
    ii) TCP   **(8 marks)**

    b) If a server supports more than one application, explain how UDP/TCP port numbers can be used to multiplex these applications over IP.   **(7 marks)**

    c) Explain how TCP is able to ensure the reliable transfer of data between computers such that any errors that occur during transmission are corrected.   **(10 marks)**

4. *a)* Modern networks including the Internet use the packet switching technique to transport message packets from the sender to the receiver. Briefly explain the concept of packet switching. List and explain the types of delays such message packets encounter along the path from sender to the receiver.
                                                                                (11 marks)

    b) The Internet uses both TCP and UDP protocols to deliver services to the users. Identifying a service delivered by each protocol, discuss the characteristics of each protocol.   **(14 marks)**

Turn over]

5. *a)* Define the terms *bandwidth* and *capacity* as applied to data communication systems and briefly explain their significance.

In a data communication system, if the signal power is 10mW, the noise power is 1000 nW and the bandwidth of the system is 100kHz, calculate the maximum capacity of the system. **(12 marks)**

b) Explain the following technologies with reference to the local subscriber loop:

i) Integrated Services Digital Network (ISDN)
ii) Asymmetric Digital Subscriber Line (ADSL) **(13 marks)**

6. *a)* Explain why bit errors are more common in wireless networks than in wired networks. Describe a method of detecting these errors. **(10 marks)**

b) Enterprise network systems are increasingly subjected to attacks by intruders. Describe THREE common types of these attacks. **(6 marks)**

c) List and explain the FOUR key properties of a secure data communication network. **(9 marks)**