

THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION Diploma

COMPUTER NETWORKS

20th April 2005, 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 the difference in operation of a *repeater*, *bridge* and *router* and show how these relate to the ISO 7 layered model. **(12 marks)**
 - b) An organisation operates an IEEE 802.3 CSMA/CD LAN and an IEEE 805.2 token ring LAN. By considering the operation of these two LAN technologies, identify the key differences that exist at the MAC layer. **(8 marks)**
 - c) By means of a protocol layer diagram show how an IEEE 802.3 and IEEE 802.5 LAN can be interconnected by a *router*. **(5 marks)**

2.
 - a) Explain the term *baud* rate. **(2 marks)**
 - b) A transmission system uses a coding scheme that defines a symbol as comprising one of eight possible voltage levels. How many bits of information can be represented by each symbol? **(4 marks)**
 - c) If the coding scheme described in part *b*) is used to transmit information at the rate of 100 baud, what is the information rate measured in bits/sec? **(4 marks)**
 - d) What are the advantages of using Manchester encoding to transmit digital information over a serial transmission system? **(6 marks)**
 - e) Show, with the aid of a diagram, how the bit pattern `10010111` would be encoded using Manchester encoding. **(9 marks)**

3.
 - a) Explain the basic operation of an ATM network. **(10 marks)**
 - b) Illustrate, by means of a diagram, the cell format used with an ATM network. **(5 marks)**
 - c) Explain the difference between a *virtual path* and a *virtual channel*. **(4 marks)**
 - d) What function is performed by the ATM adaption layer (AAL)? **(6 marks)**

Turn over]

4. a) What are the advantages of internetworking? List, and briefly describe, the typical devices you would use for internetworking. **(10 marks)**
- b) Identify and explain the major issues that must be addressed in a typical internetworking environment. **(15 marks)**
5. a) Explain clearly, with schematic diagrams, the methods used for detecting single-bit and two-bit errors in data transmitted between a sender and a receiver. What are the limitations, if any, of the two-bit error detection scheme? **(9 marks)**
- i) Explain with the help of an example the term *burst errors*. **(2 marks)**
- ii) A message frame 1101011011 is to be transmitted using a Cyclic Redundancy Check (CRC) scheme with a generator polynomial of 10011. Determine the transmitted message frame. Briefly explain how the CRC scheme helps to track the burst errors in this case. **(14 marks)**
6. a) Explain why the use of private keys alone for message encryption is not attractive for transactions in a large-scale network such as the Internet. **(2 marks)**
- b) Show the main steps of an RSA algorithm and comment on factors such as key size, message block, speed of execution etc. associated with the algorithm. **(15 marks)**
- c) Briefly explain the problem of message authentication. How do the RSA encryption and decryption schemes help to overcome this problem? **(8 marks)**