

# THE BRITISH COMPUTER SOCIETY

## THE BCS PROFESSIONAL EXAMINATIONS BCS Level 5 Diploma in IT

### COMPUTER NETWORKS

17<sup>th</sup> October 2007, 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.*

Only <b>non-programmable</b> calculators are allowed in this examination.
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1. A total of 10 computers (C1 to C10) are connected to a LAN switching hub to form a LAN. Assuming that the LAN switching hub has just been switched on and C1 transmits a LAN frame destined to C5 and then C5 replies with a frame destined to C1, determine which ports these frames are transmitted over and how the switching hub is able to learn the port numbers on which both C1 and C5 are located. **(12 marks)**  
  
What is meant by the term 'Virtual LAN' ? **(4 marks)**  
  
How could the LAN switching hub described in part (a) be configured to support two virtual LANs; one with a membership of C1 to C5 and the other with a membership of C6 to C10? **(9 marks)**
2. Explain what is meant by the term 'protocol layering'. **(6 marks)**
  - a) By means of a protocol layer diagram based on the ISO seven layer reference model, show how data is transmitted from one computer to another over a network and clearly indicate on the diagram what is meant by a 'peer to peer protocol'. **(14 marks)**
  - b) What functions are performed by the Transport layer within the ISO seven layer model? **(5 marks)**
3.
  - a) What functions are performed by a router? **(8 marks)**
  - b) Explain the basic principles behind the operation of the Open Shortest Path (OSPF) routing protocol. **(12 marks)**
  - c) How are routers able to prioritise traffic and provide a different quality of service to different traffic flows? **(5 marks)**
4.
  - a) What does it mean to say that IP offers a best-effort unreliable delivery service? Include in your answer how datagrams may arrive out of order. **(6 marks)**
  - b) Explain how TCP builds a reliable delivery service, using an unreliable service (IP). **(12 marks)**

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- c) Give examples of the type of applications that typically use UDP in preference to TCP and explain why these applications work better using an unreliable protocol for the delivery mechanism. **(7 marks)**
5. a) Illustrate the structure of a cell in an ATM (Asynchronous Transfer Mode) network. You may use a diagram to illustrate your answer. **(5 marks)**
- b) Explain how ATM combines the advantages of circuit switching and packet switching. **(12 marks)**
- c) In the context of ATM explain the difference between a Permanent Virtual Circuit and a Switched Virtual Circuit and the advantages and disadvantages of each. **(8 marks)**
6. a) If a physical network is based on i) optical fibre, ii) shielded copper wire or iii) wireless transmission, explain which is the least likely to produce errors and which is most likely to produce errors and why? **(5 marks)**
- b) Explain the difference between error detection and error correction. Which approach requires more information to be sent, in addition to the original data? **(4 marks)**
- c) Explain an approach to burst error correction. **(8 marks)**
- d) A 7-bit ASCII character is encoded using the Hamming code and is transmitted to a receiver. If the bit pattern 11000010101 is received, show how the receiving station checks for an error.
- i) Determine if there is any error, and show how the error can be corrected.
- ii) What was the original ASCII character?
- iii) Determine the code efficiency of the encoder. **(8 marks)**