

THIS PAPER IS NOT TO BE REMOVED FROM THE EXAMINATION HALLS

UNIVERSITY OF LONDON

291 0208

BSc Examination
for External Students

COMPUTING AND INFORMATION SYSTEMS

Telecommunications and Computer Communications

Dateline: Wednesday 20 May 2009 : 2.30 – 5.30 pm

Duration: 3 hours

There are six questions in this paper. Candidates should answer **FOUR** questions.

All questions carry equal marks and full marks can be obtained for complete answers to **FOUR** questions.

A hand held calculator may be used when answering questions on this paper but it must not be pre-programmed or able to display graphics, texts or algebraic equations. The make and type of machine must be stated clearly on the front cover of the answer book.

Question 1

- a) State whether each of the following statements is either true or false:
- i) Twisted pair cables can be used for gigabit Ethernet connections.
 - ii) The IEEE802.11b protocol is commonly used for wireless transmissions.
 - iii) CDMA stands for Carrier Detection Multiple Access.
 - iv) The Signal-to-Noise Ratio (SNR) of a channel is normally expressed in dB/W.
 - v) Ethernet uses Differential Manchester encoding to transfer data.
- [5]
- b) Briefly describe how Broadband and Baseband share the available bandwidth between a number of users.
- [4]
- c) How long will it take to download a file containing 1000 8-bit characters over a communications link with a bandwidth of 50kHz and signal-to-noise ratio of 30dB?
- [4]
- d) What is:
- i) the maximum bit rate
 - ii) the maximum baud rate
- for a noise free communications channel with a bandwidth of 10MHz that is able to support digital transmissions using four different voltage levels?
- [6]
- e) List and briefly describe three functions performed by a modem.
- [6]

Question 2

- a) State whether each of the following statements is either true or false and, if false, give a corrected version:
- i) The Transport layer is the lowest layer in the OSI stack that operates end-to-end between two application processes.
 - ii) UDP is a connection-oriented protocol.
 - iii) IPv6 provides 2 x 64 bit address fields.
 - iv) MPEG is a lossless form of data compression.
- [7]
- b) Feedback and forward error detection and correction are two approaches to deal with errors that occur during transmission. Compare and contrast the two methods, stating clearly where one would be used in preference over the other.
- [6]
- c) List four functions performed by the Data Link layer in the OSI Reference Model.
- [4]
- d) The string 101101100111000, arranged in the order b1...b15, has been received. The string contains a Huffman coded word that has even Hamming check bits added.
- i) Use the Hamming check bits to determine if the received data has been corrupted, and if so, to correct the bit(s) in error.
 - ii) Hence recover the original data string (i.e. with the Hamming check bits removed).
 - iii) Use the table below to decode the resulting sequence and hence recover the original text.
- [4]
[1]
[3]

L	010	P	101
M	001	R	111
N	00	S	100
O	011	T	110

Question 3

- a) State whether each of the following statements is true or false and, if false, correct the statement:
- i) 10Base5 Ethernets use coaxial cables.
 - ii) The Ethernet exponential back-off algorithm can result in a frame not being transmitted.
 - iii) FTP is a connectionless protocol.
 - iv) Contention is not a problem for Token Ring networks.
- [6]
- b) Compare and contrast the methods of error detection and correction used in the IEEE802.3 and IEEE802.5 protocols.
- [5]
- c) List five situations where wireless data transmission would be used in preference to a fixed link.
- [5]
- d) Explain three reasons why CSMA/CD is not a suitable protocol to control access in a wireless communication network.
- [9]

Question 4

- a) State whether each of the following statements is true or false and, if false, correct the statement:
- i) Wireless networks are easier to install and manage than fixed wire networks.
 - ii) The effectiveness of the CRC error check method depends on the number of bits in the Generator polynomial.
 - iii) Bridges can be used to enhance network security.
 - iv) Public key encryption is also known as asymmetric key encryption.

[6]

- b) Briefly describe the terms 'looking for an edge' and 'market innovation' in terms of how a company may gain competitive advantage. Identify and describe a business or service that has gained competitive advantage through the use of wireless network technology. Your answer should explain clearly what advantage has been achieved and whether this could have been achieved through the use of a fixed wire network.

[7]

- c) The following string has been produced using a transposition cipher with the key 'exams':

ISIPTUOISTSLQISEHENM

Decrypt the message and hence recover the original plaintext. (Note, spaces have been omitted).

[6]

- d) Discuss the process of authentication and explain why it is required even if a message is encrypted.

[6]

Question 5

- a) Compare, with the aid of sketch, the layers and their functions, as defined by the OSI and TCP/IP models. [5]
- b) Explain how the OSI or TCP/IP model masks the differences between file structures and hence enables file transfers to take place transparently between different types of computer. [4]
- c) Most files would have the data they hold, compressed in some way. At what layer of the OSI model would compression be associated? [1]
- Describe and evaluate the effectiveness of two different methods of compression, one suitable for text data and the other for image data. [6]
- d) With reference to the OSI model, describe three security measures that may be implemented, one in each of the top three layers of the model, that may be used to enhance network security. Indicate whether the measures that you have described will offer protection against viruses, hackers or both. [9]

Question 6

- a) State whether each of the following statements is true or false and, if false, correct the statement:
- i) A worm cannot exist on its own, it has to be part of another piece of code.
 - ii) A firewall only provides partial protection for a network.
 - iii) HTML is an application protocol used to define web pages.
 - iv) SNMP stands for Simple Network Management Protocol.
- [6]
- b) List three reasons why a company may wish to adopt a distributed architecture and two possible disadvantages.
- [5]
- c) What do you understand by the term *Denial of Service* attack? What is the purpose of such attacks, how might they be implemented and how might you protect against them?
- [6]
- d) Define Mean Time To Repair (MTTR) in terms of the three elements that contribute to its overall value. Show how the Mean Time To Repair (MTTR) and Mean Time Between Failures (MTBF) determine the Availability of a system. Express their relationship in the form of an equation.
- What is the Availability PSTN link (as a %) if it has an MTBF of 5 months and an MTTR of 9 hours?
(You may assume that 1 month = 30 days and 1 day = 24 hours)
- [8]

END OF EXAMINATION