

UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2002

COMPUTING AND INFORMATION SYSTEMS

IS52002A (CIS208) Telecommunications and
Computer Communications

Duration: 3 hours

Date and time:

Answer FOUR questions.

Full marks will be awarded for complete answers to FOUR questions.

There are 100 marks available on this paper

Electronic calculators may be used. The make and model should be specified on the script and the calculator must not be programmed prior to the examination.

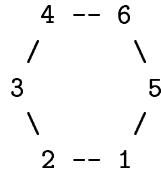
**THIS EXAMINATION PAPER MUST NOT BE
REMOVED FROM THE EXAMINATION ROOM**

Question 1 (a) Explain the following terms and concepts

[8]

- (i) data communication
- (ii) ISO
- (iii) multi-point line configuration
- (iv) half Duplex

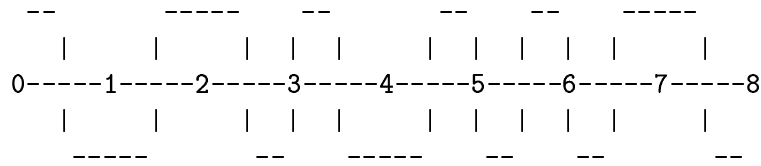
(b) A LAN of *six* computers is to be reviewed in order to minimise the number of links, and the topology below has been found. Name the type of the topology, comment on the suitability of the topology and suggest a technically best alternative if possible. Draw the new topology. [8]



- (c) Explain briefly the meaning of multiplexing. Of the different types of multiplexing, what distinguishes TDM? [4]
- (d) What is the bandwidth of a signal that can be decomposed into four sine waves with frequencies at 10Hz, 25Hz, 50Hz and 250Hz? All maximum amplitudes are 10 volts. Draw the frequency spectrum. [5]

Question 2 (a) Explain briefly how *bipolar* signaling differs from *unipolar* signaling? Which one would normally experience fewer errors? Does Manchester encoding belong to bipolar or unipolar scheme? [6]

(b) The diagram below shows the Manchester signal for a bit pattern. What is the bit pattern? Draw the Differential Manchester signals for the same bit pattern. [6]



(c) Suppose that digital data is sent as a modulated analogue signal using a similar scheme to QAM. The *four* phase changes 45, 135, 225 and 315 degree are each combined with *two* amplitude level 6 volts and 10 volts. The *two* phase changes 90 and 270 degree are each associated with *four* amplitude levels 6 volts, 10 volts, 16 volts and 22 volts. Draw the constellation diagram for this and derive the quantity relationship between the data rate and the baud rate in this case. [9]

(d) Encrypt string ON THE SPUR OF THE MOMENT (excluding spaces) by a *transposition cipher* using a key 'white'. Demonstrate how to recover the original from the ciphertext. [4]

Question 3 (a) Describe briefly *whitenoise*. When does it normally occur and what is the main cause or influence? [4]

(b) Choose one correct answer from each of the following sub-questions: [5]

(i) Which of the following is *not* a responsibility of a data link protocol?

- a. determining when a computer can transmit
- b. determining where a message begins
- c. determining the voltage to use when transmitting a message
- d. determining where a message ends
- e. determining how a receiver recognizes a transmission error

(ii) Using the Shannon formula to calculate the data rate for a given channel with a bandwidth of 30KHz, if $S/N = 0$, then

- a. the channel capacity is less than the bandwidth
- b. the channel capacity is greater than the bandwidth
- c. the channel capacity is equal to the bandwidth
- d. the channel capacity is zero regardless of the bandwidth
- e. none of the above

(c) Suppose that an error occurred during the transmission of the *even* Hamming code 101111010111 of a binary code. Correct the error bit and write the original binary code (without parity bits) which was meant to be sent. [8]

(d) Explain why data compression is useful especially in telecommunication. Given an alphabet code below that derived from a Huffman coding, decode the encoded message below: [8]

010000111000000000000010001011111001010111100

Code for the alphabet:

A 000	H 100	S 11101
B 001	N 101	T 11110
C 010000	P 110	U 11111
D 010001	Q 111000	E 010110
G 011	R 111001	F 010111