

UNIVERSITY OF SWAZILAND

Faculty of Science

Department of Computer Science

MAIN EXAMINATION DECEMBER 2017

Title of Paper: NETWORKS AND CODING THEORY I

Course Number: CS437

Time Allowed: 3 hours

Instructions to candidates:

This question paper consists of FIVE (5) questions. Answer any FOUR (4) questions

Marks are indicated in square brackets.

All questions carry equal marks (25 Marks Each).

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THE INVIGILATOR.**

QUESTION 1

- a) What do you mean by link-to-link layers of OSI reference model? Describe the function of any two layers of the OSI Model. [9]
- b) What is the difference between bit rate and baud rate [3]
- c) What is the difference between TCP and UDP? [4]
- d) Write short notes on the following: [9]
- i. Co-axial Cable and UTP cable for Data communication.
 - ii. LAN, MAN and WAN
 - iii. ARPANET

QUESTION 2

- a) Describe and distinguish between FDM and TDM. [8]
- b) State the Shannon's major result formula for Maximum Data Rate of a Channel and calculate the capacity of a noisy channel whose bandwidth is 1 MHz and signal-to-noise ratio 40 dB. [4]
- c) Given the binary information 01011001001001, show how it can be transmitted over and analogue transmission medium using [5]
- i. Amplitude shift keying
 - ii. Frequency shift keying
 - iii. QPSK
- d) Explain different kinds of switching techniques? [8]

QUESTION 3

- a) Describe character stuffing and bit stuffing. [6]
- b) What is Hamming Distance? Find the Hamming Distance for the codewords 00100001001, 01000000001, 11000000011, 10001110001. [5]
- c) Given the data, $M(x) = 1101011111$ assuming CRC is used with a generator function $G(x) = x^4 + x + 1$. Find the bit string $T(x)$ to be transmitted. [8]
- d) Explain what is Simplex Stop-and-Wait protocol for a noisy channel? [6]

QUESTION 4

- a) The network operator in Swaziland, SPTC, is promoting ADSL as a network access technology for providing Internet access to the home. With regard to this context, explain what is meant by term 'asymmetric' and why is it suited to accessing the world wide web. State the main limitation of ADSL. [6]
- b) An 8-bit byte with binary value **10101111** is to be encoded using an even-parity Hamming code. How many check bits are needed to ensure that the receiver can detect and correct single bit errors? What is the binary value, codeword, after encoding? [5]
- c) Briefly describe the following techniques:
- i. Phase Shift Keying (PSK) [4]
 - ii. Pulse code modulation (PCM) [4]
- d) "Packet switching provides more efficient communication of data between computers than is possible with circuit switching". Briefly contrast the end-to-end characteristics of a packet-switching network compared with those of a circuit switched network. [6]

QUESTION 5

- a) Explain how pure ALOHA system and slotted ALOHA system work. [10]
- b) A static FDM with 10 independent channels. Calculate the mean time delay if channel capacity 100 Mbps with frames arrival rate 5000 frames/sec and the frame average length 10000 bits. [5]
- c) Briefly explain what happens in CSMA/CD when a node detects that its data has suffered a collision? [4]
- d) Explain the comparison of 802.16 with 802.11 and 3G. [6]

End of Question Paper