

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCES
COMPUTER SCIENCE DEPARTMENT
MAY EXAMINATIONS 2011

SUBJECT: DATA COMMUNICATIONS
CODE: SCS 2101

Instructions to candidate:

1. Answer any four questions. The paper contains five questions.
2. All questions to be answered with respect to Data Communications.

3 Hours

QUESTION ONE

- | | |
|--|------|
| a) Define and Differentiate between a PSTN and a PSDN. | [8] |
| b) What is the importance of the Open System Standard? | [10] |
| c) Differentiate between a DTE and a DCE. | [4] |
| d) What is the importance of a modem? | [3] |

QUESTION TWO

- | | |
|---|------|
| a) Differentiate between a digital repeater and an analogue repeater. | [5] |
| b) A transmission channel between two communicating DTEs is made up of three sections. The first introduces an attenuation of 16dB, the second an amplification of 20dB and the third an attenuation of 10dB. Assuming a mean transmitted power level of 400mW, determine the mean output power level of the channel. | [10] |
| c) Explain in detail the operation of the Ethernet protocol, including but not limited to layer of operation, physical topology, logical topology, wired environment and wireless environment. | [10] |

QUESTION THREE

- | | |
|---|------|
| a) Data is to be transmitted over the PSTN using a transmission scheme with eight levels per signaling element. If the bandwidth of the PSTN is 3000Hz. | |
| i) Deduce the Nyquist maximum data transfer rate C | [4] |
| ii) Calculate the modulation efficiency B | [4] |
| b) Discuss the importance of computer security in data communication. | [15] |
| c) What is data goodput ? | [2] |

QUESTION FOUR

- a) Assuming that a PSDN has a bandwidth of 5000Hz and a typical signal to noise power ratio of 20dB, determine the maximum theoretical information (data) rate that can be achieved [5]
- b) How has modern day communication impacted on the way we perform our day to day tasks? Discuss. [20]

QUESTION FIVE

- a) A 1000 – bit block of data is to be transmitted between two DTEs. Determine the ratio of the propagation delay to the transmission delay, α , for the following types of data link.
 - i) 100m of twisted-pair wire and a transmission rate of 10kbps. [3]
 - ii) 10km of coaxial cable and a transmission rate of 1Mbps. [3]
 - iii) 50 000km of free space (satellite link) and a transmission rate of 10Mbps. [4]

Assume the velocity of propagation of an electrical signal within each type of cable is $2 \times 10^8 \text{ms}^{-1}$ and that through free space is $3 \times 10^8 \text{ms}^{-1}$.

- b) Nine stations S1 – S9 are connected to an extended LAN through transparent bridges B1 B2 and B3 as shown in the figure below. Initially, the forwarding tables are empty. Suppose the following stations transmit frames as follows: S7 → S6, S1 → S3, S1 → S5, S5 → S7, S8 → S6, S9 → S8, S8 → S1, S4 → S3, S7 → S9 and S2 → S1. Show how the bridges populate their forwarding tables. [15]

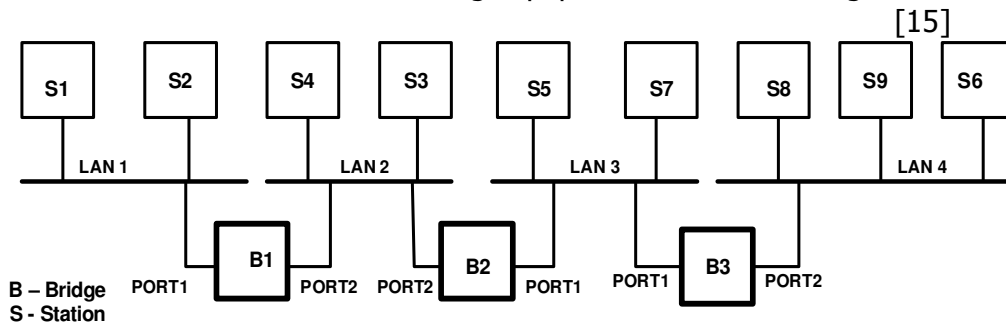


Figure 5

Forwarding Table B1		Forwarding Table B2		Forwarding Table B3	
Address	Port	Address	Port	Address	Port

END OF QUESTION PAPER