MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

SIT 306: DATA COMMUNICATIONS

DATE: 4/8/2017 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS

Answer Question One and Any Other Two Questions

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Explain the meaning of the following terms

i Multiplexing

ii Token

iii Cipher

iv Base band

v Baud (1 mark Each)

b) Distinguish between

i Analogue data and Digital Data

ii Analogue signal and Digital Signal

iii ISO reference model and network protocol

iv Packet switching and Message switching (8 marks)

c) Define OSI Model. Explain the function, protocols and services of each layer? (7 marks)

d) The power we use at home has a frequency of 60 Hz. Determine the period of the sine wave (4 marks)

e) As a system administrator briefly discuss the steps you would follow to trouble shoot a communication problem in the network (6 marks)

QUESTION TWO (20 MARKS)

a) Explain the meaning of the following terms
   i Frequency
   ii Phase
   iii Transceiver
   iv Gateway (8 marks)

b) The period of a signal is 100 ms. what is its frequency in kilohertz? (6 marks)

c) Outline the IPv6 protocol (2 marks)

d) Outline two advantages and two disadvantages of fiber optic cable over copper cable (4 marks)

QUESTION THREE (20 MARKS)

a) We need to download text documents at the rate of 100 pages per sec. Assume that a page is an average of 24 lines with 80 characters in each line and one character requires 8 bits (ascii). What is the required bit rate of the channel? (3 marks)

b) A digitized voice channel is made by digitizing a 4-kHz bandwidth analog voice signal. We need to sample the signal at twice the highest frequency (two samples per hertz). We assume that each sample requires 8 bits. What is the required bit rate? (3 marks)

c) Describe the following threats to network security: (4 marks)
   i. Eaves-dropping
   ii. Denial- of- Service

d) Briefly describe **FOUR** of the major protocols found in networking environments today. (2.5 marks each)

QUESTION FOUR (20 MARKS)

a) A code scheme has a Hamming distance $d_{min} = 4$. What is the error detection and correction capability of this scheme? (4 marks)

b) Explain the following terms
   i) Frequency Division Multiplexing (FDM)
   ii) Wavelength Division Multiplexing (WDM)
   iii) Time Division Multiplexing (TDM) (2 marks each)

c) The Advanced Mobile Phone System (AMPS) uses two bands. The first band of 824 to 849 MHz is used for sending, and 869 to 894 MHz is used for receiving. Each user has a bandwidth of 30 kHz in each direction. How many people can use their cellular phones simultaneously? Explain the solution and the assumptions made. (8 marks)

d) Define the term Unicast systems and broadcast systems (2 marks)

QUESTION FIVE (20 MARKS)

a) Five channels, each with a 100-kHz bandwidth, are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 kHz between the channels to prevent interference? (4 marks)

b) Differentiate between a **single mode** and a **multi-mode** fiber optic cable (4 marks)

c) The figure below shows synchronous TDM with 4 1Mbps data stream inputs and one data stream for the output. The unit of data is 1 bit.

Find;

i The input bit duration,

ii The output bit duration,

iii The output bit rate, and

iv The output frame rate. (Show workings) (3 marks each)