KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCINCE

COURSE CODE: **COMP 222**

COURSE TITLE: **TELECOMMUNICATIONS AND COMPUTERS**

STREAM: **Y2S2**

DAY: **TUESDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **04/08/2009**

INSTRUCTIONS:

1. **Answer Question ONE and any other TWO questions.**
2. **Question ONE carries 40 marks. Questions TWO – FOUR carry 15 marks each.**

PLEASE TURN OVER

QUESTION ONE (30 Marks)

a) Briefly define a network.

(3 marks)

b) Identify the at least *two* of the basic components of a data communications system.

(2 marks)

c) Briefly describe the functions of the transport layer in the OSI model.

(4 marks)

d) What is the bandwidth of a signal that has frequencies ranging from 50 KHz to 5 MHz?

(2 marks)

e) An analog signal carries 6 bits in each signal unit. If 1000 signal units are sent per second, find both the baud rate as well as the bit rate of the signal.

(4 marks)

f) Briefly differentiate between the operations of Ethernet and token ring networks.

(8 marks)

g) Name at least three characteristics which are specified in the RS-232 standard.

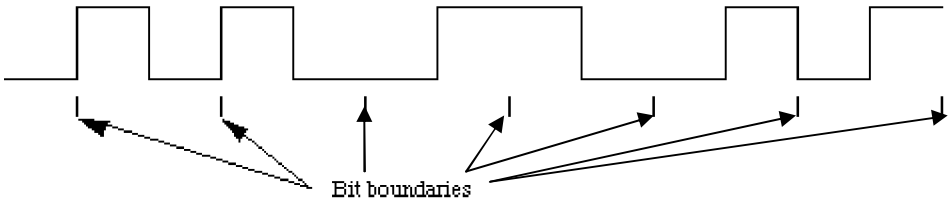
(3 marks)

h) Why is the Asymmetric Digital Subscriber Line (ADSL) service provided by telephone companies called *asymmetric* and why is it not very suitable for corporate clients?

(4 marks)

QUESTION TWO (20 MARKS)

a) The figure below represents the Manchester encoding of a certain data stream. What is the data stream?



(6 marks)

b) Differentiate between the following methods of error detection in data transmission;

i. parity check
ii. checksum
iii. cyclic redundancy check

(9 marks)

c) A signal with a bandwidth of 60 Hz is made up of 10 different waves. The highest frequency in the signal is 100 Hz.

i. Determine the lowest frequency in the signal
ii. Draw the frequency spectrum of the signal, assuming the frequency gaps between the different waves is equal and all have the same magnitude.

(5 marks)

QUESTION THREE (20 MARKS)

a) According to Nyquist's theorem, what sampling rate is required for a signal whose bandwidth ranges from 1000Hz to 15000Hz?

(4 marks)

b) With the aid of diagrams, show how you would connect a hybrid topology with a bus backbone connecting two ring backbones. One of the ring backbones connects four star networks of five nodes each while the other one connects five nodes.

(10 marks)

c) Differentiate between serial and parallel data transmission modes and give one advantage of each transmission mode.

(6 marks)

QUESTION FOUR (20 MARKS)

a) Name the main categories of multiplexing used for transmission of signals. For each category, describe briefly how it is implemented.

(12 marks)

b) Differentiate between low-pass and band-pass transmission media and state which one is preferred for analog transmissions and which one is preferred for digital transmissions. Give an example of when a cable such as coaxial can be used to transmit data digitally.

(8 marks)

QUESTION FIVE (20 MARKS)

a) Name the three main types of unguided media used in telecommunications. For each category, state the following;

   i. mode of propagation
   ii. frequency ranges
   iii. two applications

(12 marks)

b) Find the minimum bandwidth for an FSK signal transmitting at 2 kbps. Transmission is in half-duplex mode and the carriers are separated by a gap of 3000 Hz.

(4 marks)

c) Convert the decimal number 115 to its equivalent in

   i. binary
   ii. hexadecimal

(4 marks)