KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: COMP 222

COURSE TITLE: TELECOMMUNICATIONS AND COMPUTERS

STREAM: Y2S2

DAY: TUESDAY

TIME: 2.00 – 4.00 P.M.

DATE: 07/12/2010

INSTRUCTIONS:

- Answer **ALL** the questions in **PART ONE** and any **TWO** questions in **PART TWO.**

PLEASE TURNOVER

PART ONE
QUESTION ONE (30 MARKS)

a. Describe three impairments that a signal undergoes as it is transmitted along a transmission medium **(3 marks)**

b. Describe three advantages that digital transmission has over analog transmission **(3 marks)**

c. In pulse code modulation;

i. How can the digital reproduction of an analog signal be improved with regard to precision and accuracy? **(2 marks)**

ii. What is meant by the term quantization noise? **(1 marks)**

d. An analog signal with frequency components between 300 Hz and 3400 Hz is sampled at a rate of 4000 samples per second. It is then quantized with a quantizer using 64 quantization levels. The quantized samples are then binary encoded.

i. Calculate the Nyquist sampling rate of the analog signal **(1 mark)**

ii. Calculate the bit rate of the resultant digital signal**.** **(2 marks)**

e. What are the two main disadvantages of the unipolar line coding scheme. **(2 marks)**

f. Briefly describe

i. Return to zero code **(2 marks)**

ii. Manchester code **(2 marks)**

g. Give one disadvantage of return to zero code as compared to Manchester code **(2 marks)**

h. Describe

i. Quadrature amplitude modulation **(4 marks)**

ii. 4PSK (phase shift keying) **(4 marks)**

i. A transmission medium has a bandwidth of 3400 Hz. Calculate the maximum bit rate achievable on the medium if FSK, using frequencies 1700 Hz and 2400 Hz for modulation is used. **(2 marks)**

PART TWO
QUESTION TWO (20 MARKS)

a. Describe multiplexing and demultiplexing. What is the main advantage of using these techniques? **(3 marks)**

b. Five signals have the following bit rates.

Signal 1	240 bps
Signal 2	720 bps
Signal 3	480 bps
Signal 4	240 bps
Signal 5	960 bps

The signals are time division multiplexed. Calculate the number of time slots per frame and the duration of a frame given that 6 bits are transmitted per timeslot. **(3 marks)**

c. How many signals, each with a bandwidth of 770 Hz, can be frequency division multiplexed using a guard band of 40 Hz onto a transmission link with a bandwidth of 11500 Hz. **(2 marks)**

d. Name the two main circuit switching techniques. **(2 mark)**

e. Using a diagram describe how a time slot interchanger switch works. **(4 marks)**

f. A multistage crossbar switch is designed using the following information.

- 50 inputs and 50 outputs
- 3 stages
- 5 crossbar switches in the first stage
- 3 crossbar switches in the second stage
- 5 crossbar switches in the third stage

Calculate the number of crosspoints the multistage switch has? **(4 marks)**

g. Describe the main disadvantage of a multistage crossbar switch **(2 marks)**

Question Three (20 marks)

a. Explain what the number of bits affected by a burst error depends on. **(3 marks)**

b. Explain why the checksum error detection method does not detect all errors involving even number of bits. (3 marks)

c. What is the code rate and distance for the simple parity check error detection scheme? **(2 marks)**

d. Two communicating devices A and B communicate over a noisy transmission medium. The use the (7, 4) hamming code for error correction. Device B receives the following data from device A which is transmitted from left to right (first bit to be received is binary 1).

0010101000110110000001101111

Determine if any errors occurred during transmission. Use the following information about the (7,4) hamming code. (6 marks)

$$\text{Generator Matrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{bmatrix}$$

$$\text{Parity Check Matrix} = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

e. Describe the stop and wait ARQ method **(3 marks)**

f. Describe two disadvantages of the stop and wait ARQ method. **(3 marks)**

QUESTION FOUR (20 MARKS)

a. What is the difference between random access and controlled access methods? **(3 marks)**

b. Describe the

i. ALOHA multiple access method. **(3 marks)**

ii. Token passing access method **(3 marks)**

c. Describe the composition of;

i. Coaxial cable

ii. Unshielded twisted pair cable **(3 marks)**

d. Describe three advantages of fiber optic cable as compared to coaxial cables **(3 marks)**

e. What are the two main disadvantages of satellite communications? **(2 marks)**

f. Name the three random access methods that are used in cellular communication **(3 marks)**