

## National Exams May 2011

### 98-Comp-B5 Computer Communications

#### Note

- If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
- Candidates may use one of two calculators, the Casio or Sharp approved models. This is a Closed Book exam.
- Any five questions constitute a complete paper. Only the first five questions as they appear in your answer book will be marked.
- All questions are of equal value (20% each).

**Question 1 (20 marks)**

An analog signal (sine wave) of 200 Hz with a peak-to-peak amplitude of 10 Volt is sampled at the sampling frequency of 800 Hz. Find another two analog sinusoids (other than 200 Hz) which, when sampled at 800 Hz, will yield exactly the same sample values (as the 200 Hz sine wave). What would this phenomena called?

**Question 2 (20 marks)**

Assume that a binary signal is transmitted over a channel with bandwidth of 3 kHz. (1) Determine the maximal transmission rate, if the channel is noise-free; and (2) Determine the maximal transmission rate, if the channel has a signal-to-noise ratio of 30 dB.

**Question 3 (20 marks)**

Plot the Differential Manchester Code for the message  $M=11010001010$ . (Assume that the first bit starts at a high voltage level)

**Question 4 (20 marks)**

In a Cyclic Redundancy Check (CRC) scheme, if  $P=110011$  and  $M=111100011$ , determine the corresponding CRC.

**Question 5 (20 marks)**

List each layer of OSI Model in sequence from top down and explain the functions of each layer in detail.

**Question 6 (20 marks)**

Please answer the following questions:

- (1) Explain the concept of and reasons for 'spread spectrum';
- (2) Draw illustrative diagrams for the transmitter and receiver pair of 'frequency hopping spread spectrum'; and
- (3) Draw illustrative diagrams for the transmitter and receiver pair of 'direct sequence spread spectrum'.

**Question 7 (20 marks)**

Explain the following technical terms: (1) Parity bit; (2) Bit Error Rate; (3) modem; (4) Codec; (5) Crosstalk; (6) CSMA/CD; (7) Decibel; (8) B-ISDN; (9) TCP/IP; and (10) Packet.