

## National Exams May 2015

### 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? How do you mitigate such a problem?

**Question 2 (20 marks)**

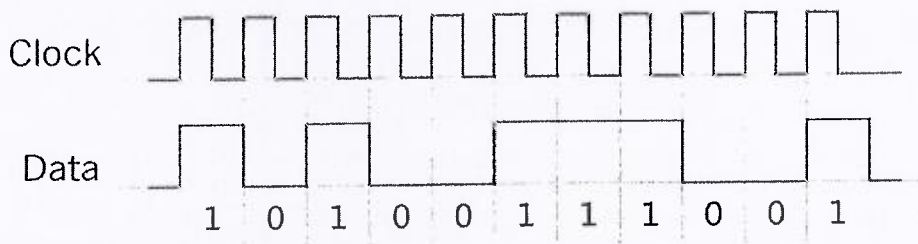
Assume that a binary signal is transmitted over a channel with bandwidth of 5.6 kHz. (1) Determine the maximal transmission rate, if the channel is noise-free; and (2) Determine the maximal transmission rate, if the channel has a signal-to-noise ratio of 30 dB.

**Question 3 (20 marks)**

A Pulse Code Modulation (PCM) based encoder converts an analog signal with a 10 V full-scale to generate 12-bit codes using uniform quantization. Determine (a) normalized step size, (b) actual step size in volts, (c) maximum quantized level in volts, and (d) actual voltage resolution.

**Question 4 (20 marks)**

A data sequence and the clock are shown below in Fig. Q4, Draw waveforms based on (a) Manchester encoding and (b) Differential Manchester encoding of the sequence



Manchester Code

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Differential Manchester Code

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Fig. Q4

**Question 5 (20 marks)**

A company has just got ten new computers. To make best use of the share resources, an intranet is to be constructed to link all ten machines in a form of network. What are the potential network configurations that you can recommend for the network architecture? Explain the advantages and the drawbacks of each chosen configuration.

**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) Full duplex; (2) QPSK; (3) SMTP; (4) Codec; (5) Crosstalk; (6) CSMA/CD; (7) FFT; (8) UDP; (9) TCP/IP; and (10) Packet.