

National Exams December 2016

98-Comp-B5 Computer Communications

3 hours

Note

- If doubt exists as to the interpretation of any question, the candidate is urged to submit with the detailed 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 60 Hz with a peak-to-peak amplitude of 10 Volt is sampled at the sampling frequency of 400 Hz. Find another two analog sinusoids (other than 60 Hz) which, when sampled at 400 Hz, will yield the same sample values (as the 60 Hz sine wave). Explain: (1) why this situation can happen; (2) How to deal with such a situation in practice?

Question 2 (20 marks)

For a communication channel with an intended capacity of 500 Mbps, the bandwidth of the channel is 25 MHz. What would be the desired signal-to-noise ratio to achieve this capacity?

Question 3 (20 marks)

Suppose that you are given a task to design a network for 10 computers in an office building together with two shared network enabled printers. You are free to choose any of the following network architectures: (a) Star; (b) Multi-drop; (c) Loop; (d) Tree; (e) Mesh; and (f) Mesh of trees.

(1) Draw the network topologies for each of the above options; and (2) comments on advantages and drawbacks for each topology in terms of reliability; speed; easy of sharing common resources; and security.

Question 4 (20 marks)

A communication channel is known to have a loss of 10 dB. If the input signal power is measured as 1.0 Watt, and the output noise level is measured as 3 μ Watt, what is the output signal-to-noise ratio in dB?

Question 5 (20 marks)

In a Cyclic Redundancy Check (CRC) scheme, if $P=110011$ and $M=11100011$, determine the corresponding CRC.

Question 6 (20 marks)

For a network with the address 198.53.147.45 and the subnet mask 255.255.255.224, what is the class of the network? and what are the network ID, subnet ID, and host ID? Explain how you arrive at your answers in detail.

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.