RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. in Information Technology
Second Year - Semester II Examination – January / February 2023

ICT 2305 – COMPUTER NETWORKS

Time: Three (03) hours

Instructions

- Answer **ALL** questions.
- This paper contains **five** (05) questions in **three** (03) pages.

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1. a) Discuss the advantages of computer networks regarding the following:

i. Flexible access.

ii. Centralized administration.

(4 marks)

b) Explain the use of the following devices in computer networks:

i. Repeater.

ii. Router.

iii. Firewall.

(6 marks)

c) Write short notes on each of the following:

i. Campus area networks.

ii. Enterprise private networks.

iii. Peer-to-peer networks.

(6 marks)

d) Sketch a diagram to illustrate the hybrid network topology using a star-ring hybrid topology network with a star backbone (a network connecting other networks) and three (03) ring networks.

(4 Marks)

2. a) "In n-layer network architecture, layer n on one machine carries on a conversation with layer n on another machine using layer n protocols." Draw a diagram to illustrate the virtual communication and the physical (actual) communication between two (02) hosts (Host A and Host B) in a 4-layer network architecture. Assume that there are no other intermediate networks or devices between the two (02) hosts.

(6 marks)

b) Explain the importance of having a clear interface between two (02) layers in layered network architecture.

(4 marks)

c) Name the OSI layer(s) which should be implemented in routers? Explain the reason(s) for your answer.

(4 marks)

d) Explain the following responsibilities of the network interface layer of the TCP/IP reference model:

i. Encapsulation of IP packets into frames.

ii. Error detection.

(6 marks)

3. a) What is framing error in asynchronous transmission? Explain the reason(s) for having this error.

(4 marks)

b) Explain the following with respect to wireless transmission:

i. Two (02) types of microwave transmission techniques.

ii. Advantages of radio waves.

(6 marks)

c) Assume three (03) channels, each with an 80 kHz bandwidth, are to be multiplexed together into a link with a bandwidth of 300 kHz, from 200 kHz to 500 kHz using FDM. Find the bandwidth of the each channel on the link,

i. If there are no guard bands.

ii. If there is a guard band of 20 kHz between the channels.

(6 marks)

d) Why is a statistical time division multiplexer more efficient than a synchronous time division multiplexer?

(4 marks)

4. a) Discuss the need for framing in communication networks.

(4 marks)

b) Suppose that the following character coding is used in a data link protocol:

A : 01000010
B : 01000011
FLAG : 01111110
ESC : 11100000

Assume a frame to be sent over a transmission link contains the following payload:

ABESCFLAG

Show the bit sequence of the payload transmitted over the link,

i. If the framing protocol uses byte stuffing.

ii. If the framing protocol uses bit stuffing.

Suppose both the starting and ending delimiter of a frame is 01111110.

(4 marks)

c) Explain the following with examples:

i. Length of the burst error.

ii. Parity check.

(6 marks)

d) Find the codeword for the dataword 1001 if the CRC error detection technique is used with the divisor 1011.

(6 marks)

5. a) "The Internet has chosen the datagram approach to switching at the network layer." Explain the reason for this.

(4 marks)

b) Find the network identifier and host identifier of each of the following classful IP addresses:

i. 130.30.13.10

ii. 220.20.10.130

(4 marks)

c) Find the number of addresses in the block containing the IP address 192.168.2.36/27. What are the first and the last addresses of this block?

(6 marks)

d) Suppose an organization is given the IP block 34.17.4.0/25, which contains 128 addresses. The organization needs to divide this address block into three (03) subnets of 32, 64 and 32 addresses. Find the subnet mask and the subnet address for each subnet.

(6 marks)

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