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# University of Ruhuna - Faculty of Technology

## Bachelor of Information & Communication Technology Honours Degree

## Level 1 (Semester II) Examination, November/December 2022

## Academic year 2020/2021

**Course Unit: ICT 1253 Computer Networks (Written)** **Duration: 2 hours**

This question paper contains **five (05) pages** including this instruction page.

IMPORTANT INSTRUCTIONS

- The medium of this examination is **English**.
- This is a **Closed Book** examination.
- This Examination consists of **four (04)** questions that are given equal marks.
- You must **answer all four (04) questions** in this examination.

1.

a) Briefly explain the term **computer networks.**

*[5 marks]*

b) Briefly explain the following two major types of computer architecture stating two (02) advantages for each type.

i. Client server architecture

ii. Peer-to-peer architecture

*[20 marks]*

c) State the purpose of following protocols used in application layer.

i. FTP

ii. SMTP

*[10 marks]*

d) Consider the following statement regarding the Transport layer.
"Transport layer is responsible for end-to-end transportation of data between applications".

i. Compare **Transmission Control Protocol (TCP)** and **User Datagram Protocol (UDP)** used in transport layer considering two (02) key aspects.

*[20 marks]*

ii. A three-way handshake is used to establish a TCP connection. Illustrate the main stages of the three-way handshake using a suitable diagram.

*[20 marks]*

e)

i. State the Shannon's formula (Nyquist Theorem) for capacity of a noisy channel.

*[10 marks]*

ii. A signal with added noise has a bandwidth of 2000 Hz assigned for data communication. The SNR is usually 2047. What will be the capacity for this channel?

*[15 marks]*

2.

a) Briefly describe the purpose of an IP address.

*[5 marks]*

b) Consider the two classful IP addresses given below. Identify the class of each IP address.

i. 179.100.5.89

ii. 15.200.255.13

*[10 marks]*

c) You have sub-netted your class C network 212.108.2.0 with a subnet mask of 255.255.255.224.

i. What is the maximum number of subnets that you can create?

***[10 marks]***

ii. Calculate the usable hosts per subnet that can be created?

***[10 marks]***

iii. Identify following parameters of the first subnet

I. Network address (Subnet address) ***[5 marks]***

II. Broadcast address ***[5 marks]***

III. Usable IP range ***[10 marks]***

d) Suppose that a company ABC Pvt (Ltd) has five (05) departments, namely, Finance, Management, Human Resources, Marketing and Sales. The network address of the company is 198.224.3.0/24.
The number of host computers in each of the department is given in Table Q2.

Table Q2

| Department | No. of hosts |
|---|---|
| Finance | 23 |
| Management | 5 |
| Human Resources | 48 |
| Marketing | 9 |
| Sales | 2 |

Using **unequal subnetting** concept, identify the following for each department

i. Subnet mask

ii. Network address (Subnet address)

iii. Broadcast address

***[45 marks]***

3.

a) Consider the following statement regarding the Data Link Layer.
"Frames are the protocol data unit used in Data Link layer and framing is a function of the data link layer which provides a way for a sender to transmit a set of bits that are meaningful to the receiver".

i. Identify four (04) framing methods which are commonly used in Computer Networks.

***[8 marks]***

ii. Suppose that the number of bits allocated for header, payload and trailer of a fixed size frame is 12, 25 and 12, respectively. Calculate the required number of frames, if 275 bits of actual data are to be transmitted as frames.

*[10 marks]*

b) Briefly explain the statement "Datalink layer is responsible for error control".

*[5 marks]*

c) Suppose that the received sum of data at the receiver's side is 11010101 when the transmitted data unit by the sender is 10011001 10100010 00110100 1000001. Assuming that an **8-bit checksum** is used,

i. Calculate the checksum value generated at the sender's side.

*[20 marks]*

ii. Justify the existence or non-existence of an error.

*[10 marks]*

d) Suppose that a received code word is 1111011 when **7-bit hamming code** is used. Assuming the even parity, identify whether there is an error with the received code word and locate the error if there is any.

*[35 marks]*

e) Identify difference between **unacknowledged connectionless service** and **acknowledged connected oriented service** considering three (03) key aspects.

*[12 marks]*

4.

a) Consider the following statement regarding the Network Layer
"The network layer is responsible for routing packets".

i. Briefly explain the purpose of routing algorithms.

*[5 marks]*

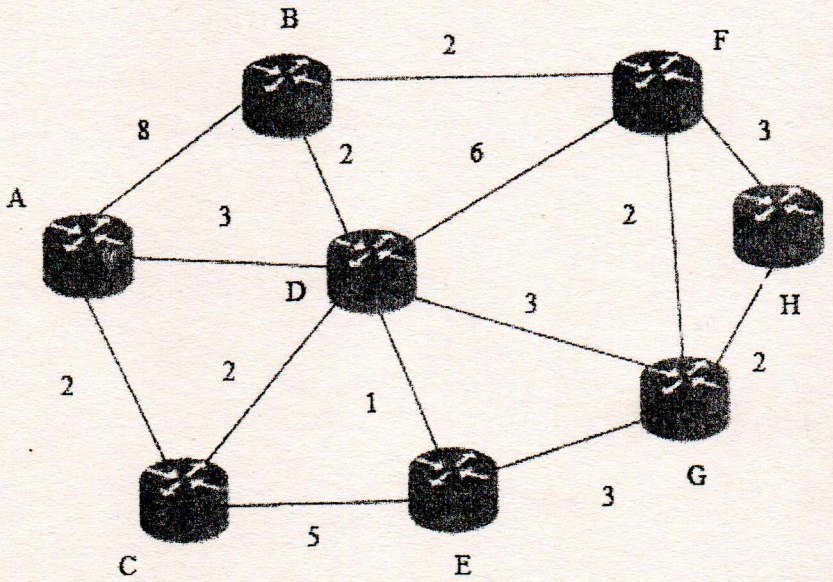
ii. Identify and describe three (03) common requirements that need to be fulfilled by routing algorithms.

*[15 marks]*

iii. Identify the differences between **static routing algorithms** and **dynamic routing algorithms** considering two (2) key aspects.

*[20 marks]*

b) Consider the following network topology in which the cost of each link is given. Find the **shortest path** from **Router A** to every other router in the topology by using **link state routing algorithm**. Provide your steps using a table.




***[60 marks]***

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