University of Colombo, Sri Lanka

University of Colombo School of Computing

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2020— 2^{nd} Year Examination — Semester 4

IT4405 — Computer Networks

Part 2 - Structured Question Paper

(ONE HOUR)

To be completed by the candidate							
Index Number							

Important Instructions

- The duration of the paper is **ONE HOUR**.
- The medium of instructions and questions is English.
- This paper has **3** questions and **8** pages.
- Answer **all 3** questions. All questions **do not** carry **equal** marks.
- **Write your answers in English** using the space provided **in this question paper**.
- Do not tear off any part of this answer book.
- Under no circumstances may this book (or any part of this book), used or unused, be removed from the Examination Hall by a candidate.
- Questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
- Any electronic device capable of storing and retrieving text, including electronic dictionaries and mobile phones, are **not allowed**.
- Calculators are **not** allowed.
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To be completed by the examiners

1	
2	
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Total	

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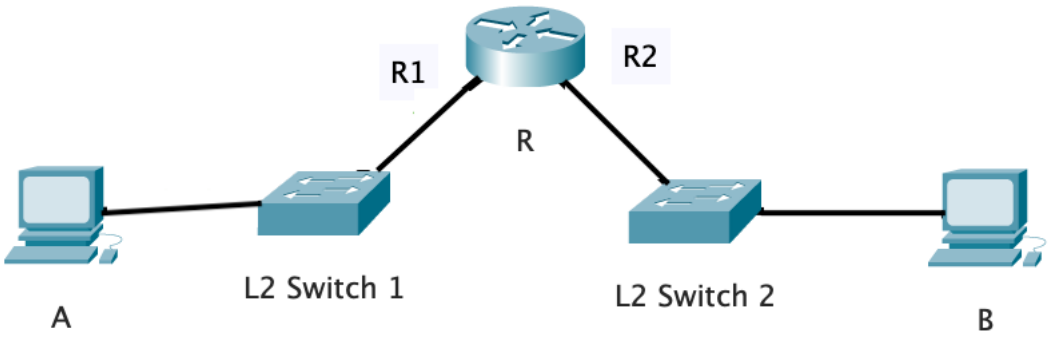
1.



Consider the network depicted in the diagram above. R has two interfaces, R1 and R2. It is configured to forward packets between R1 and R2. The interface R1 of R is configured with the IP address 192.168.1.62/27. R1 has the MAC address 08:00:27:84:64:E0. R2 has the MAC address 08:00:27:84:64:F0. A and B have only a single network interface. A's interface has the MAC address 08:00:27:84:64:E1. B's network interface is configured with the IP address 192.168.2.254/24 and it has the MAC address 08:00:27:84:64:F1.

An IP packet, P, is sent from machine A to machine B.

(a). What is a suitable IP address for the network interface of A? Justify your answer.

[8 marks]

Any address in the range $192.168.1.33 - 192.168.1.61$. The addresses assigned to the network interface of A and R1 should be in the same subnet. Since R1 is in the 192.168.1.32/27 network, A's interface should be assigned an IP address from this network, excluding the IP assigned to R1.

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(b). What is a suitable IP address for the interface R2 of R? Justify your answer.

[8 marks]

Any address in the range $192.168.2.1 - 192.168.2.253$.
B and R2 should be in the same subnet.
Since B is in the 192.168.2.0/24 network, R2 should be assigned an IP address from this network, excluding the IP assigned to B.

(c). Assume that the network address assignment is to be fixed for a long time into the forceable future. However, the number of machines connected to the LAN consisting of Switch 1 may change from time to time. You are required to purchase a Switch for this LAN and you are under a very tight budget. How many ports should be in the Switch that you propose to purchase?

[10 marks]

This LAN can accommodate at most 30 machines since it is a /27 network. Therefore, we should plan to accommodate at most 30 machines. Since there are budgetary restrictions we should not go for a larger switch.

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(d). What is the utility, which uses the ICMP protocol, that can be used on machine A to check the connectivity between A and B?

[4 marks]

ping

(e). What is the destination MAC address on the link layer frame that carries packet P when it leaves A? Justify your answer.

[10 marks]

P has to be forwarded to R. Therefore, destination MAC should be the MAC of the interface R1.
08:00:27:84:64:E0

(f). What is the source MAC address on the link layer frame that carries packet P when it reaches B? Justify your answer.

[10 marks]

The packet is forwarded to B by R. It is sent over the interface R2 of R. Therefore, the source MAC address on the link layer frame is the MAC address of R2.
08:00:27:84:64:F0

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2. (a). Draw a diagram depicting the TCP/IP reference model.

[5 marks]

ref: Figure 1-21 in the textbook (*Computer Networks by Andrew Tannenbaum, 5th edition*).

(b). What is the main functionality of the Transport layer of the TCP/IP model?

[5 marks]

"*It is designed to allow peer entities on the source and destination hosts to carry on a conversation*."
ref: page 47 in the textbook (*Computer Networks by Andrew Tannenbaum, 5th edition*).

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(c). According to the TCP/IP reference model, applications do not interact directly with the IP protocol. However, this is misleading. Network addresses are not transparent to applications. Therefore, if network addresses change, applications may have to change as well. Explain, giving a suitable example.

[15 marks]

There are application layer protocols, such as DNS, that directly return an IP address to the application. Applications have to know the format and the size of the network addresses to store and interpret them. If the address format or length is changed then applications have to be changed to work correctly with the new format.

An answer that demonstrates that there are general protocols or APIs that expose the IP address to applications is acceptable.

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3. (a). Draw a diagram depicting message exchange in the three-way handshake used in TCP to establish a connection.

[5 marks]

ref: Figure 6-37 in the textbook (*Computer Networks by Andrew Tannenbaum, 5th edition*).

(b). Describe the SYN flood attack on TCP.

[10 marks]

"*a malicious sender can tie up resources on a host by sending a stream of SYN segments and never following through to complete the connection*."
ref: page 561 in the textbook (*Computer Networks by Andrew Tannenbaum, 5th edition*).

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(c). Draw a graph of Congestion-Window-Size Vs Time to depict how the approximate size of the congestion window changes with time (RTT). There is no need to give exact values.

[10 marks]

ref: Figure 6-46 in the textbook (*Computer Networks by Andrew Tannenbaum, 5th edition*).

It is sufficient to just show the sawtooth pattern.

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