University of Colombo, Sri Lanka

University of Colombo School of Computing

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2021— 2^{nd} Year Examination — Semester 4

IT4506 — 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 **2** questions and **8** pages.
- Answer both questions. Both questions 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**.
- Non Programmable Calculators may be used.
- *All rights reserved.*

To be completed by the examiners

1	
2	
Total	

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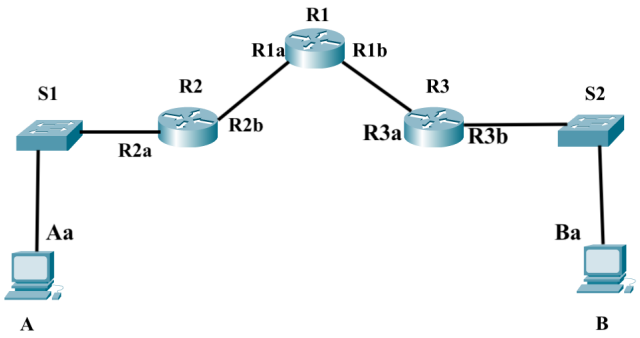
1.



Consider the network depicted in the diagram above. R1, R2, and R3 are routers. A and B are two machines (computers). Partial information about the MAC and IP addresses of the interfaces of the machines and routers are given bellow.

Machine	Interface	MAC address	IP address
A	Aa	MAa	192.168.1.1/28
B	Ba	MBa	192.168.3.1/28
R1	R1a	MR1a	192.168.2.1/30
R1	R1b	MR1b	192.168.2.5/30
R2	R2a	MR2a	
R2	R2b	MR2b	
R3	R3a	MR3a	
R3	R3b	MR3b	

The IP packet P, sent from machine A, has reached machine B.

(a). What is a suitable IP address for the network interface R2a? Justify your answer.

[10 marks]

Any address in the range 192.168.1.2– – 192.168.1.14. The addresses assigned to the network interface R2a should be in the same subnet as the interface Aa. Since Aa has the address 192.168.1.1/28 , R2a interface should be assigned an IP address from this network, excluding the IP assigned to Aa.

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(b). What is a suitable IP address for the interface R3a? Justify your answer.

[10 marks]

The only possible address is 192.168.2.6. R3a should be in the same subnet at R1b. R1b's address is 192.168.2.5/30. The only other address available in this network is 192.168.2.6.

(c). Assume that all the ports in S2 are occupied. There are no free IP addresses available in the LAN connected through S2 and all the machines with the IP addresses are connected to S2. How many ports are there in the switch S2?

[10 marks]

This LAN can accommodate at most 14 machines since it is a /28 network. Therefore, the switch has 14 ports.

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(d). What was the destination MAC address on the link layer frame that carried packet P when it left R1? Justify your answer.

[10 marks]

P has to be forwarded to R3. Therefore, destination MAC should be the MAC of the interface R3a.
MR3a

(e). What was the destination IP address on the packet P when the frame carrying P left R1?

[10 marks]

The destination IP address does not change when P travels through the network. It is always the IP address of Ba.
192.168.3.1

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2. (a). Write down the main objective of the Transport layer.

[6 marks]

provide efficient, reliable, and cost-effective data transmission service to users/ processes in the application layer.

(b). The transport layer obtains services from the Network layer and provides services to the Application layer. This task is done by the Transport Entity.

i. Write down two (2) locations where the Transport Entity can be found.

[4 marks]

kernel of the operating system
library package in the network application
on the network interface card (NIC)

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ii. Draw a diagram depicting the logical relationship of the Network, Transport, and Application layers including the *Transport Entity*.

[10 marks]

Figure 6-1 in the text book, Computer Networks

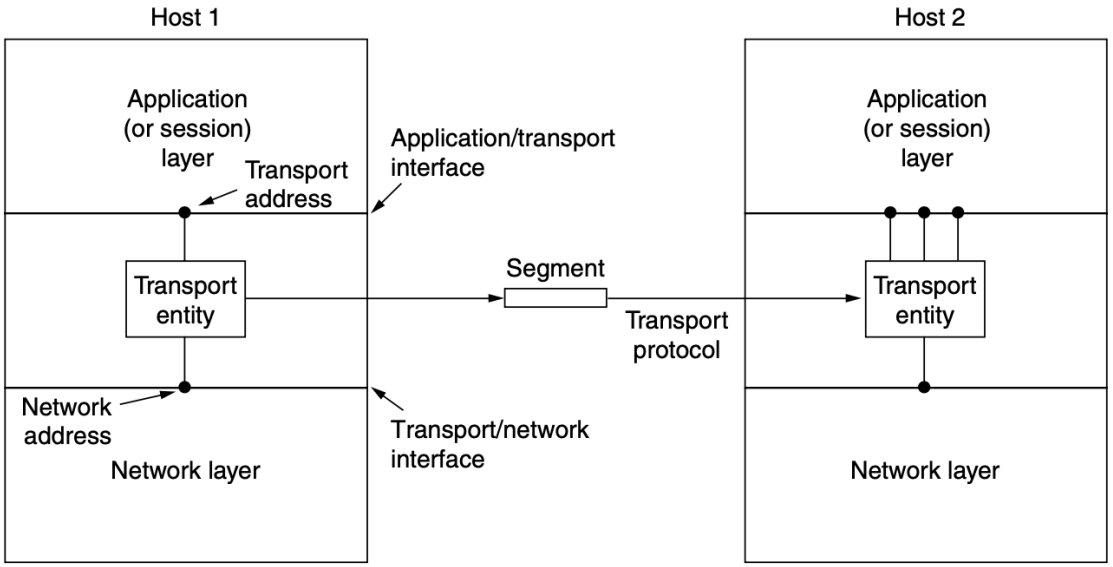

Figure 6-1. The network, transport, and application layers.

(c). What is the purpose of using port numbers in the Transport layer?

[12 marks]

Ip address can only uniquely indentify interfaces.
There are multiple applications/processes running on the same machine.
Those are the transport endpoints. There has to be another address to uniquely identify the applications (processes).
Port numbers are used to identify these transport endpoints uniquely.

(d). Can a domain name be mapped into two different IP addresses? Justify your answer.

[6 marks]

Yes.
It can have multiple IP address mapped to a single domain name.
Need to add multiple A records for the same domain name.

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(e). Draw a diagram depicting the architecture of an email system including the main subsystems.

[12 marks]

Figure 7-7 - page 624 Text book. user agents, message transfer agents, Mail submission, Message transfer, SMTP

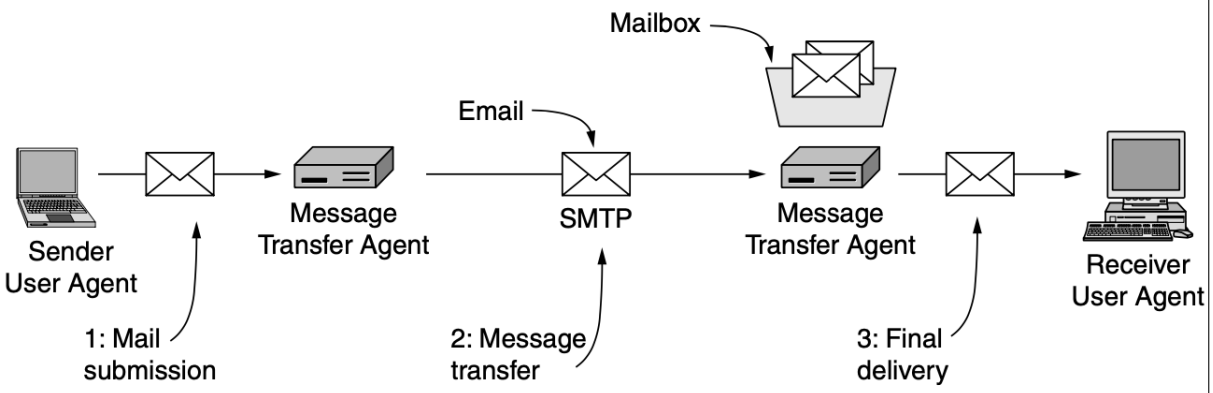

Figure 7-7. Architecture of the email system.

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