University of Colombo, Sri Lanka

University of Colombo School of Computing

BIT

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2022— 2nd 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 **7** 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**.

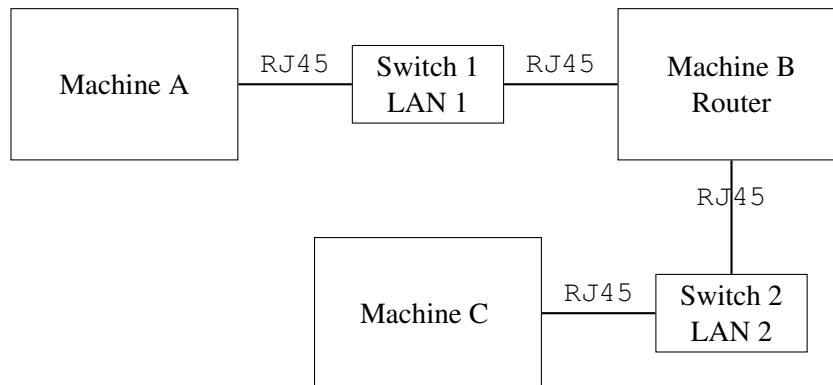- Non Programmable Calculators may be used.

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To be completed by the examiners

1	
2	
Total	

1. An IP packet **P** is sent from the machine **A** to the machine **C** in the network depicted in the following diagram.

The configurations of the machines are given bellow.

Machine	Interface	MAC address	IP address	Subnet Mask
A	eth0	MA0	8.8.1.1	255.255.255.192
B	eth0	MB0	8.8.1.10	?
B	eth1	MB1	192.168.10.254	255.255.255.0
C	eth0	MC0	192.168.10.1	255.255.255.0

(a). What is the destination MAC address in the data link layer frame containing **P** in LAN 1? Justify your answer.

[15 marks]

MB0
The only path from A to C goes through B. According to the table the eth0 interface of B is on the LAN that contains A based on their IP addresses. Threfore, the frame must be sent to eth0 of B.

(b). What is the subnetmask of the IP address assigned to the interface **eth0** of **B**? Justify your answer.

[15 marks]

255.255.255.192

eth0 of A has the above subnet mask. Since eth0 of B is also connected to the same network, it should also have the same subnetmask.

(c). What is the source IP address of **P** when it goes through the **Switch 2**? Justify your answer.

[10 marks]

8.8.1.1

The source IP address should be the IP address of A. Source IP does not change when the packet goes through the router.

(d). What is the source MAC address on the link layer frame containing **P** when it reached **C**? Justify your answer.

[10 marks]

MB1

The frame has come through B. The interface that is connected to LAN2 in B is eth1 based on the IP addresses. The MAC address of that interface is MB1.

2. (a). **ALOHA** and **Slotted ALOHA** are two multiple access protocols.

     i. What is the main difference between **ALOHA** and **Slotted ALOHA** protocols.

[6 marks]

Slotted ALOHA has **time slots** and all the transmissions **starts at the beginning of the time slot**. (Topic 3, Slide 35)
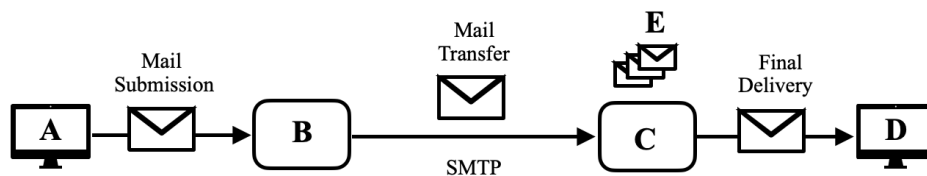
     ii. Write down the maximum throughput of ALOHA and Slotted ALOHA protocols.

[4 marks]

ALOHA - Max when G = 0.5, **S= 1/2e**.
Slotted ALOHA - max when G=1, **S= 1/e** (Topic 3, Slide 34 and slide 37)

(b). The following diagram shows the architecture of the electronic mail system.

     i. Name the components marked as A,B, C, D, and E.

[5 marks]

A- Sender user agent,
B- Message transfer agent,
C- Message transfer agent,
D - Receiver user agent,
E - Mailbox (Topic 6, Slide 18/ Ref1: pg 624)

ii. Write down a major functionality of A.

[3 marks]

allow the users to read and send emails (Topic 6, Slide 18)

iii. What is the purpose of E?

[4 marks]

store the email that is received for a user (Topic 6, Slide 20)

iv. Who is responsible for maintaining E?

[4 marks]

Maintained by the mail servers. (Topic 6, Slide 20)

v. How the server identifies whether the recipient is using **ESMTP** (Extended SMTP) instead of **SMTP** (Simple Mail Transfer Protocol).

[4 marks]

in ESMTP, EHLO message is send instead of HELO. (Topic 6, Slide 29/ Ref 1: pg 641)

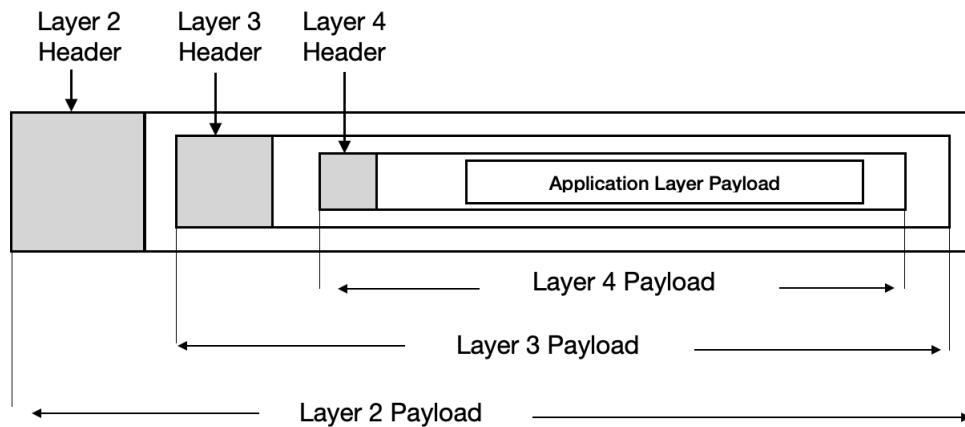vi. List two (2) extensions used in **ESMTP**.

[4 marks]

AUTH, BINARYMIME, CHUNKING, SIZE, ST ARTTLS, UTF8SMTP (Topic 6, Slide 29/ Ref 1: pg 641)

(c). Following diagram shows the packet nesting and encapsulation of payloads at each layer of OSI model.

i. List the PDU (Protocol Data Unit) names for each layer.

[6 marks]

Layer 2 - Frame

Layer 3 - Packet

Layer 4 - Segmant (Topic 5, Activity 2)

ii. List a relevant protocol for each layer.

[6 marks]

Layer 2 - Ethernet

Layer 3 - IP

Layer 4 - UDP/ TCP (Topic 5, Slide 27)

iii. Mention two (2) important information that is included in the Layer 4 header.

[4 marks]

Source port, destination port (Topic 6, Slide 16/ Ref1: pg 542)

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