# University of Colombo, Sri Lanka

*University of Colombo School of Computing*

## DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2023— $2^{nd}$ Year Examination — Semester 4

## IT4506 — Computer Networks

*Part 2 - Structured Question Paper*

(2 Hours for both Part 1 and Part 2)

| To be completed by the candidate | | | | | | | |
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| **Index Number** | | | | | | | |

**Important Instructions**

- This paper has **two (2) parts, Part 1 and Part 2**.
- The total duration of **both Part 1 and Part 2 is 2 hours**.
- The final mark for the paper will be determined by averaging the scores of Part 1 and Part 2, each of which is graded out of **100**.
- The medium of instructions and questions is English. Students should answer in the medium of English language only.
- This paper (Part 2) has **2 questions** on **7 pages**. Answer **both** questions.
- Write your answers **only on the space provided** on this question paper.
- Do not tear off any part of this question paper. Under no circumstances may this paper (or any part of this paper), used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper. If a page or part of a page is not printed, please inform the supervisor/invigilator immediately.
- Any electronic device capable of storing and retrieving text, including electronic dictionaries, smartwatches, and mobile phones, is not allowed.
- Calculators are **not allowed**.
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**To be completed by the examiners**

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| **1** | |
| **2** | |
| **Total** | |

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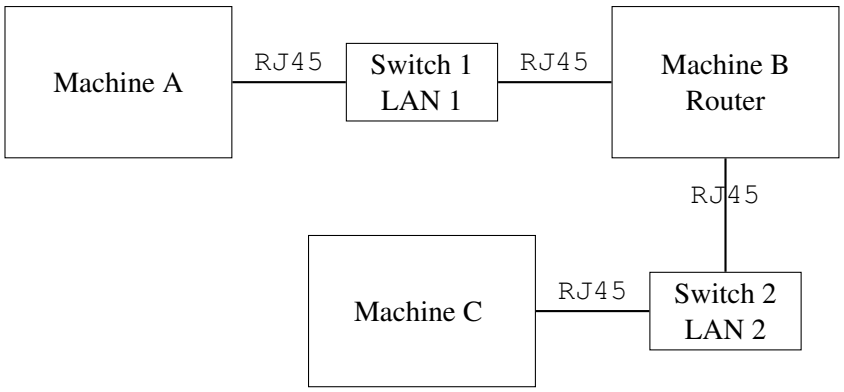
**1.** An IP datagram $P$ is sent from machine A to machine C in the network depicted in the following diagram. Machine C has successfully received $P$. $P$ is encapsulated in the link layer frame $F_1$ in LAN 1 and in $F_2$ in LAN 2. A user $X$ is logged in as the administrator of the machine C and he can observe and analyze all the link layer frames coming to C.

LAN 1 and LAN 2 use Ethernet as the link layer protocol.




(a). Is it possible for $X$ to determine the MAC address of the interface of A by analysing $F_2$? Justify your answer.

**[10 marks]**

No.
$P$ comes to C enacpsulated in a link layer frame generated by B. Therefore, $X$ can only discover the MAC address of one interface of B. No link layer frame in LAN 1 reach C.

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(b). Is it possible for $X$ to discover the subnet mask used in LAN 2, **based only on the information available in** $F_2$?
Justify your answer.

**[10 marks]**

No.
Subnet mask is not carried in an IP datagram. It is not a field in the IP header.

(c). **If** LAN 1 and LAN 2 use different link layer protocols, with different frame formats, is it possible for $P$ to be received at C? Justify your answer.

**[10 marks]**

Yes - Link layer protocol of LAN 1 is used only to pass $P$ to B. Then $P$ is extracted from $F_1$ at B an encapsulated in $F_2$. Different frame formats do not affect this process as long as $P$ can fit into the frames.
If F2 frames and less than F1 frames, then fragmentation takes place at B and all fragments will be collected at C where Packet P is constructed at C.

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(d). Is it possible for $X$ to discover the IP address assigned to the LAN 2 interface of B by analysing the information in $F_2$ ? Justify your answer.

**[10 marks]**

No - Source IP in $P$ is the IP of A and the destination IP is the IP of C. No other IP addresses are in $P$ and hence no other IP addresses are in $F_2$

(e). Describe the use of the *Address Resolution Protocol (ARP)* at B when forwarding $P$ to the machine C?

**[10 marks]**

$P$ contains the destination IP. B should find the MAC address corresponding to this IP to encapsulate $P$ in $F_2$. B uses ARP to resolve the IP to a MAC address.

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**2.** (a). *Preamble* is the first component in the *Ethernet* header. Describe the content of the *Preamble* and the purpose of it.

**[10 marks]**

8 bytes, each containing the bit pattern 10101010 (with the exception of the last byte, in which the last 2 bits are set to 11). serves as a synchronization sequence that allows the receiving system to synchronize its internal clock with the incoming data stream. Topic 3 - Page 43

(b). Redundant links in the link layer can create loops. Describe a problem that occurs when loops are present in the link layer and mention the method used to mitigate this problem.

**[8 marks]**

broadcast storms and link saturation, solution is Spanning Tree Protocol (STP), Topic 3 - Page 56

(c). In the *traditional switch architecture*, what is the plane responsible for packet buffering, and packet scheduling?

**[4 marks]**

Data plane, Topic 8 - Page 9

(d). User Datagram Protocol (UDP) is a popular transport layer protocol. List down the **four (4)** fields in the UDP header.

**[8 marks]**

Source port, Destination port, UDP Length, UDP Checksum, Topic 5 - Page 17.

(e). Describe the steps of *Remote Procedure Call (RPC)* between two machines using a suitable diagram.

**[20 marks]**

Step 1 : Client calling the client stub.
Step 2 : client stub packing the parameters into a message and making a system call to send the message.
Step 3 : The operating system sending the message from the client machine to the server machine.
Step 4 : The operating system passing the incoming packet to the server stub.
Step 5 : the server stub calling the server procedure with the unmarshaled parameters. Topic 5 - Page 20-25 (5 marks for steps, 5 marks for diagram)

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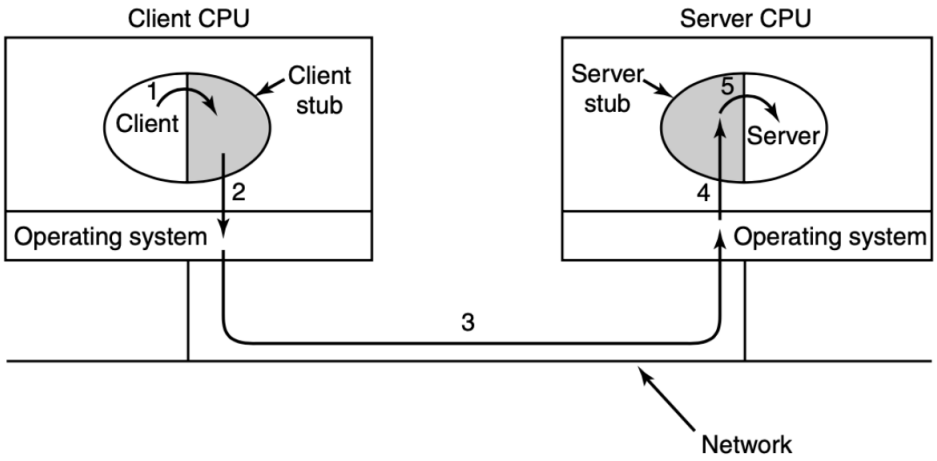


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