



University of Colombo, Sri Lanka

UCSC *University of Colombo School of Computing*



**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY
(EXTERNAL)**

Academic Year 2025— 2nd 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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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 8 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**.
- *All Rights Reserved*. This question paper can NOT be used without proper permission from the University of Colombo School of Computing.

**To be completed by
the examiners**

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Total	

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1. A BIT student, Suraj, in USA complains that he cannot connect to the `https://www.bit.lk` web server from his home network. This website is hosted at UCSC premises and runs on the IP address `192.248.22.12`. Other BIT students connecting to the same server from different countries do not have any such issues. Suraj does not have any issue connecting to other websites. Suraj, reports to the officials at UCSC that the IP address assigned to the only network interface of his machine is `192.168.1.25`. However, when he connects to the website, *W* (hosted in Germany) that reports the client's IP address, he noticed that his IP address is `62.115.190.69`.

- (a). Explain why the website *W* reports an IP address different from the one assigned to the network interface of Suraj's machine.

[10 marks]

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- (b). Is it possible for *W* to detect and report the MAC address of the Suraj's machine, just by observing the IP packets of the TCP connection made to *W*? Justify your answer.

[10 marks]

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- (c). Using standard tools to query the DNS system, Suraj found that the `www.bit.lk` and `bit.ucsc.cmb.ac.lk` both are resolved to the same IP address `192.248.22.12`. Can this be a cause of the connection problem faced by Suraj? Justify your answer.

[10 marks]

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- (d). Describe a possible reason, not related to DNS, for the problem reported by Suraj.

[10 marks]

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- (e). Suraj notices that the following string is assigned to the network interface of his computer.

2607:fb90:cf4c:c0e7:b83f:3bcd:fbbe:8841.

What is this string?

[10 marks]

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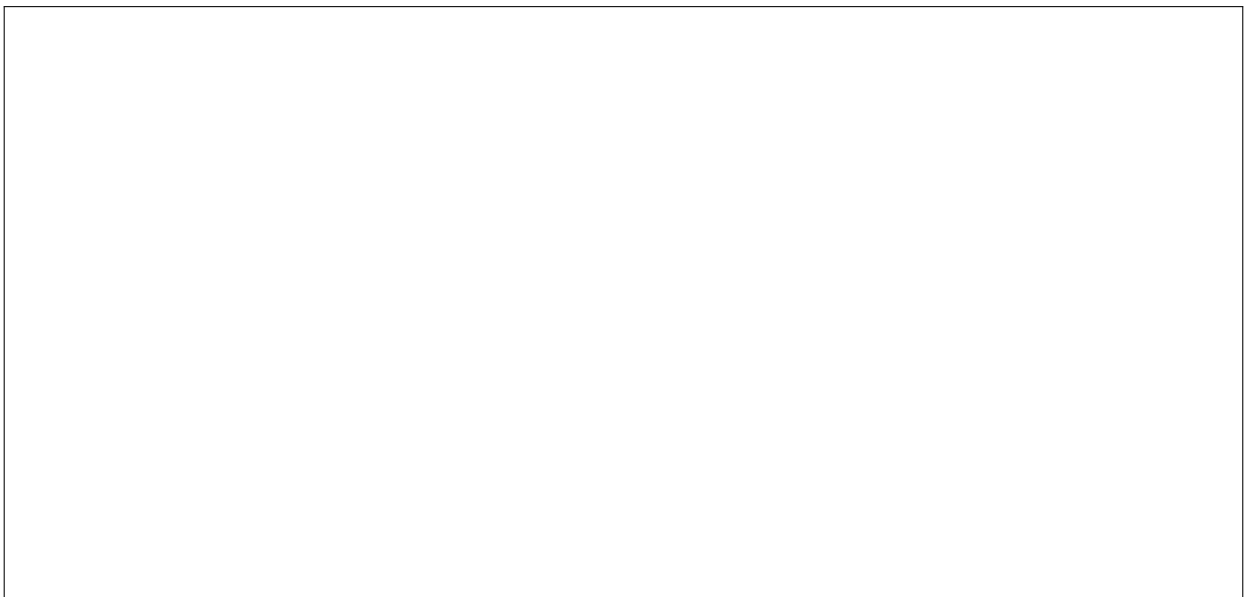
2. (a). Using a proper diagram, illustrate how a network layer packet (datagram) is encapsulated into a data link layer frame.

[8 marks]



- (b). Managing access to a shared broadcast channel among competing stations is a fundamental challenge in computer networks. Identify two (2) methods used for Static Channel Allocation.

[4 marks]



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- (c). The Transmission Control Protocol (TCP) header utilises several control flags to manage connection states. Explain the specific purpose and functionality of the RST flag.

[6 marks]

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- (d). Network congestion significantly degrades system performance. Explain a mechanism used by the Transmission Control Protocol (TCP) **to detect** and infer the onset of congestion within a network.

[6 marks]

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- (e). Explain the behaviour of the TCP Slow Start algorithm **after the detection** of network congestion.

[10 marks]

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- (f). Distinguish between the Pure ALOHA and Slotted ALOHA protocols by clearly mentioning the operational differences and the efficiency gain achieved by Slotted ALOHA over Pure ALOHA.

[10 marks]

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- (g). Identify the specific type of information mapped or returned by each of the following DNS resource records: A, AAAA, and MX.

[6 marks]

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