



University of Colombo, Sri Lanka

University of Colombo School of Computing



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

Academic Year 2026— 2nd Year Examination — Semester 4

IT4506 — Computer Networks

Part 2 - Structured Question Paper

(ONE HOUR)

To be completed by the candidate

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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.
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**To be completed by
the examiners**

1	
2	
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]

This can happen due to following reasons,

- The TCP connection from Suraj's machine go to *W* through a NAT and the IP address displayed is the public IP used by the NAT.
- This can also happen if Suraj uses an HTTP proxy.

- (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]

No. MAC addresses are not carried in the IP datagrams and therefore are not visible outside the local network.

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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]

No. Same IP address can be mapped to multiple names. Above details indicate that there is no issue in name resolution. Therefore, this is not a DNS related issue.

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

[10 marks]

- The firewall at the Suraj's end could be dropping packets to `https://www.bit.lk`.
- A firewall at the UCSC end could be dropping the packets from the Suraj's network.
- Internet routing issue.
- ...

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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]

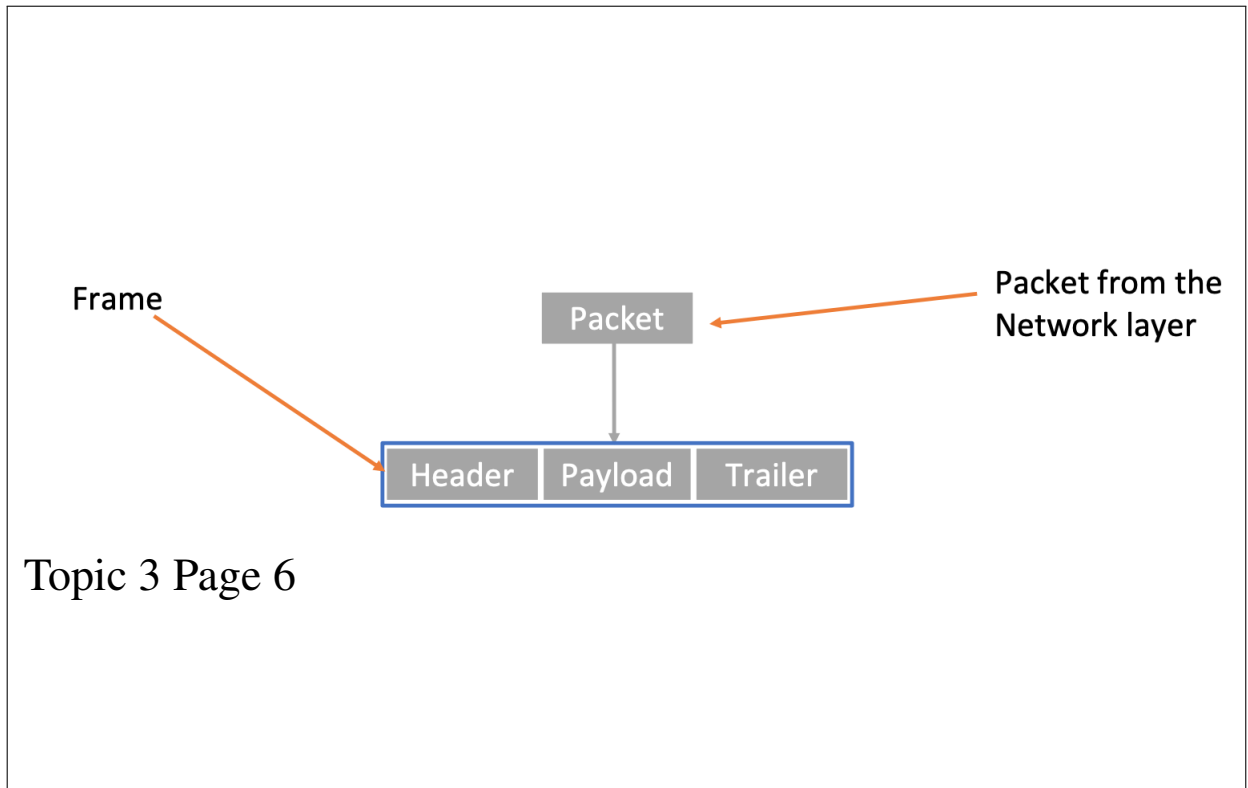
It is the IPv6 address assigned to the network interface.

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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]

Frequency Division Multiplexing (FDM)

Time Division Multiplexing (TDM)

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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]

used to terminate the connection when there is a problem in the connection

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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]

Loss of packets is a signal of the congestion.

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

[10 marks]

Upon congestion, Slow Start resets the congestion window to one MSS and enters exponential growth
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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]

Pure ALOHA allows continuous, unconstrained transmissions, whereas Slotted ALOHA restricts transmissions to discrete time slots, effectively doubling maximum protocol efficiency from 18.4% to 36.8%.
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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]

A - Maps a domain name to an IPv4 address.

AAAA- Maps a domain name to an IPv6 address.

MX- Specifies the mail exchange servers responsible for receiving email on behalf of a domain.

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