University of Colombo, Sri Lanka

UCSC *University of Colombo School of Computing*

BACHELOR OF SCIENCE IN INFORMATION SYSTEMS

First Year Examination — Semester II— UCSC AY21 [held in March 2025]

IS 1211 — Computer Networks

(2 Hours)

Answer All Questions

Number of Pages = 10 Number of Questions = 4

To be completed by the candidate								
Index Number								

Important Instructions to candidates:

- Students should answer in the medium of English language only using the space provided in this question paper.
- Note that questions appear on both sides of the paper. If a page or a part of this question paper is not printed, please inform the supervisor immediately.
- Write your index number CLEARLY on each and every page of this Question paper.
- This paper consists of **4** questions in **10** pages (including the Cover Page).
- Answer ALL questions.
- Calculators and any electronic device capable of storing and retrieving text including electronic dictionaries, smart watches and mobile phones are not allowed.
- Do not tear off any part of this answer book. Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate

To be completed by the examiners

1	
2	
3	
4	
Total	

Index Number | | | | | | | | |

1. (a). Machine A has a single network interface and the machine B has two network interfaces. The network interface of A and the interface $eth0$ of the machine B are connected to the Ethernet switch $S1$. $eth1$ interface of the machine B and the only interface of the machine C are connected to the Ethernet switch $S2$. The interface of A is configured with the IP address **192.168.1.5/30**. A TCP connection is made from the port **5000** of the machine A to the web server running on port **80** of the machine C. The IP datagrams received at C over this TCP connection has the source IP **192.168.1.5** and the source port **5000**. The datalink frame containing the IP datagrams of the TCP connection received at C has the source MAC address **08:00:27:f9:cf:12** and the destination MAC address **08:00:27:f9:cf:01**. The IP datagrams of the above TCP connection coming to A has the source IP address **192.248.16.14**. The $eth0$ interface of B has the MAC address **09:00:27:f9:cf:02**. An ARP request issued for the IP address **192.248.16.1** received a reply with the MAC address **08:00:27:f9:cf:12**. The broadcast address of the network containing C is **192.248.16.15**.

i. Draw a diagram depicting the machines, switches, and links in the network described above. Name all the components.

[4 marks]

ii. What is the IP address of the interface $eth0$ of the machine B ?

[3 marks]

iii. What is the subnetmask of the interface $eth0$ of the machine B in dotted decimal notation?

[3 marks]

Index Number | | | | | | | | |

iv. What is the IP address of the interface $eth1$ of the machine B ?

[3 marks]

v. What is the IP address of the machine C?

[3 marks]

vi. What is the network address used in the LAN that contains C?

[4 marks]

vii. Does the TCP connection from A to C go through a *Network Address Translator*? Justify your answer.

[5 marks]

Index Number | | | | | | | | |

viii. A file of size 10 KB was downloaded to A from C over this TCP link. This was the only communication between A and C. However, it was observed that more than 10 KB has been transfered from C to A. What is the reason for this?

[5 marks]

(b). Draw a diagram depicting a LAN that uses private IP addresses connected to the public network through a *Network Address Translator*. Assign suitable IP addresses to the components in the diagram.

[5 marks]

Index Number | | | | | | | | |

2. (a). i. Draw a graph to depict a Sine wave (Sinusoid) of 2000 Hz with an amplitude of 1V. Name and mark the axes of the graph.

[4 marks]

ii. A signal with a power of p W is fed to an amplifier with a gain (amplification) of x dB. What is the output power?

[5 marks]

(b). A channel has a bit error probability p. The message bit 1 is sent encoded as 111 and the message bit 0 is sent encoded as 000 on this channel. There is no error correction in this system.

i. A message 1 is sent on this channel encoded as the bit string 111. What is the probability that the receiver receives the message correctly?

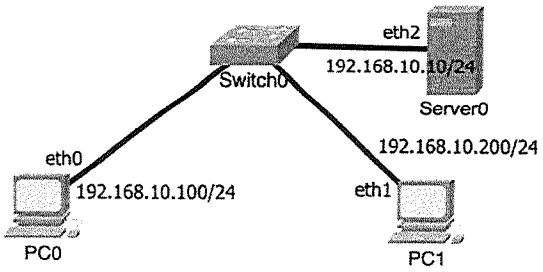
[3 marks]

ii. A message 10 is sent on this channel encoded according to the above scheme. What is the probability that the receiver receives this message correctly?

[3 marks]

Index Number | | | | | | | | |

3. Following network diagram shows a simple network with three (3) end devices (*PC0, PC1* and *Server0*) connected using a network switch *Switch0*. Interface names and IP addresses assigned for each interface are as given in the figure. All the end devices are installed with Linux operating system.



(a). Write the complete ***ifconfig*** command need to be issued on *Server0* to assign the relevant IP address to interface *eth2*.

[4 marks]

(b). **Server0** is configured as a **Web server** and hosted a web application which used within the organisation. Write down the HTTP request that needs to be sent by the client application of the **PC0** to request the login page (login.html) in the docroot from the **Web server**.

[4 marks]

(c). If the HTTP request mentioned above is successful, what should be the **status line** of the response header?

[3 marks]

Index Number | | | | | | | | |

(d). Illustrate by using a proper diagram the necessary upgrades required for the existing network setup to enable the user of PC0 to successfully connect to the **Internet**.

[8 marks]

(e). Explain the main configuration required for PC0 to connect to the **Internet** after the modification proposed as an answer to the question 3.(d) and provide the corresponding Linux command(s) to perform the configuration.

[6 marks]

Index Number | | | | | | | | |

4. (a). Discuss the role of the *Visitor Location Register (VLR)* in the GSM architecture.

[4 marks]

(b). Illustrate the GSM architecture including all the important components.

[5 marks]

Index Number | | | | | | | | |

(c). Discuss the primary differences between the **first-generation (1G)** and **second-generation (2G)** mobile networks.

[5 marks]

(d). DSL (Digital Subscriber Line) technology was introduced to use the same PSTN (Public Switched Telephone Network) infrastructure and provide better performance in networking.

i. List down two (2) advantages of DSL compared to Dial-up Internet.

[4 marks]

Index Number | | | | | | | | |

ii. Explain how the DSL uses same PSTN infrastructure and provide the better performance.

[7 marks]

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