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University of Colombo, Sri Lanka

University of Colombo School of Computing

Bachelor of Science in Information Systems

Academic Year 2016-2017 — Second Year Examination — Semester II

IS2011 — Computer Networks

(2 Hours)

Answer All Questions

Number of Pages = 11 Number of Questions = 4

To be completed by the candidate								
Index Number								

Important Instructions

- The duration of the paper is **2** Hours.
- The medium of instructions and questions is English.
- This paper has **4** questions on **11** pages.
- Answer **all** the **4** questions.
- **Write your answers on and only on the space provided** on 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.

To be completed by the examiners

1	
2	
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Total	

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1. (a). Draw a graph (Amplitude Vs Time) depicting a **Manchester encoded** signal representing the transmission of three consecutive data bits **001**. Assume that the leftmost bit is transmitted first.

[5 marks]

(b). A communication system uses **even parity** and adds a parity bit to each seven bit. Thus a **word** (8 bits) transmitted consists of 7 data bits and one parity bit.

i. How many errors can it detect in a word?

[2 marks]

ii. Assume that the i^{th} bit in a word is denoted by b_i. A word is received at the receiver without any error. What is the value of $b_1 \oplus b_2 \oplus b_3 \oplus b_4 \oplus b_5 \oplus b_6 \oplus b_7 \oplus b_8$ where $\oplus$ is the Exclusive OR operator.

[4 marks]

iii. Assume that no error has occurred in transmission and the receiver receives **111X0000**. What is **X**?

[3 marks]

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(c). i. The noise level of a channel is P_n milliwatts when the signal power is P_s milliwatts. The bandwidth of this channel is B Hz. What is the maximum bit rate of this channel according to the Shannon's law?

[2 marks]

ii. Maximum data rate of a noisy channel with a bandwidth of 1000 Hz is 4000 bits per second. What is the signal to noise ratio of this channel?

[4 marks]

(d). The noise level of a channel is 1 milliwatts and the signal to noise ratio is 20 dB. What is the signal power?

[5 marks]

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2. (a). In a public key system, Alice uses key X to encrypt a message sent to Bob and she uses the key Y to sign the message. Bob uses the key P to encrypt the reply to the message and and signs it with the key Q. Eve can listen to this exchange. Public keys are known to all the parties.

i. What is the public key of Bob?

[3 marks]

ii. What is the private key of Alice?

[3 marks]

iii. List all the people, in the above scenario, who can decrypt a message encrypted with the key Y. Inclusion of even a single person who cannot decrypt the message in the answer results in zero marks.

[3 marks]

(b). The web server you have developed during the semester opens a socket to listens to the incoming requests.

i. Write down the Python statement to open a server socket the in the web server.

[3 marks]

ii. What is the transport layer protocol of the socket that the web server opens?

[2 marks]

iii. Write down the Python statement to bind the socket to the IP address 127.0.0.1 and the port 3000.

[3 marks]

iv. Does a web **browser** use UDP when requesting a page from a web server? Justify your answer.

[4 marks]

(c). What is the protocol used to dynamically assign IP addresses to hosts?

[2 marks]

(d). What is the purpose of the address resolution protocol (ARP) ?

[2 marks]

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3. (a). A Linux machine in a LAN has the IP address **192.248.16.89** with the subnet mask **255.255.255.128** assigned to its Ethernet interface **eth0**.

i. Write the full Linux command to configure the network interface with the above IP address and the subnet mask.

[3 marks]

ii. How many IP addresses that can be assigned to machines are there in this LAN?

[4 marks]

iii. Write the subnet mask in CIDR notation.

[2 marks]

iv. The network administrator wants to divide this LAN into two LANs of equal size and each LAN should be able to accommodate 60 machines. What is the subnet masks that can be used for these smaller LANs?

[5 marks]

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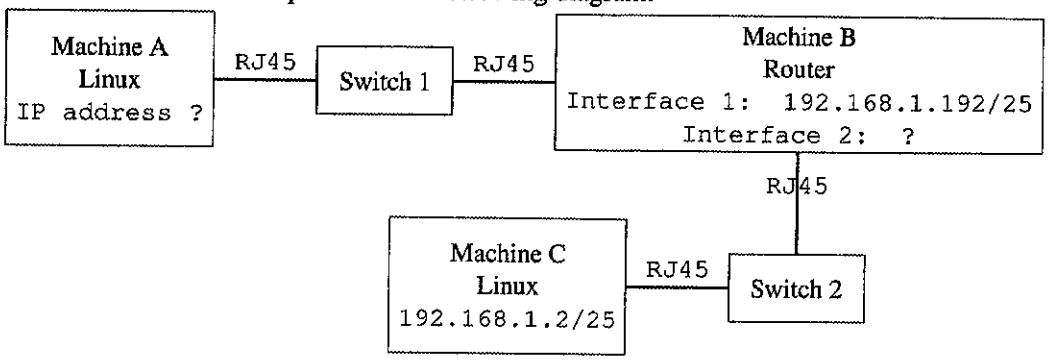
(b). Consider the network depicted in the following diagram.



Interface 1 of machine B is connected to Switch 1 and the Interface 2 is connected to Switch 2.

i. Give a suitable IP address for the Machine A.

[3 marks]

ii. Give a suitable IP address for the interface 2 of the Machine B.

[3 marks]

iii. What is the *default gateway* of Machine A?

[3 marks]

iv. What is the command that can be run on the Machine A to measure the round trip time between the Machine A and the Machine C?

[2 marks]

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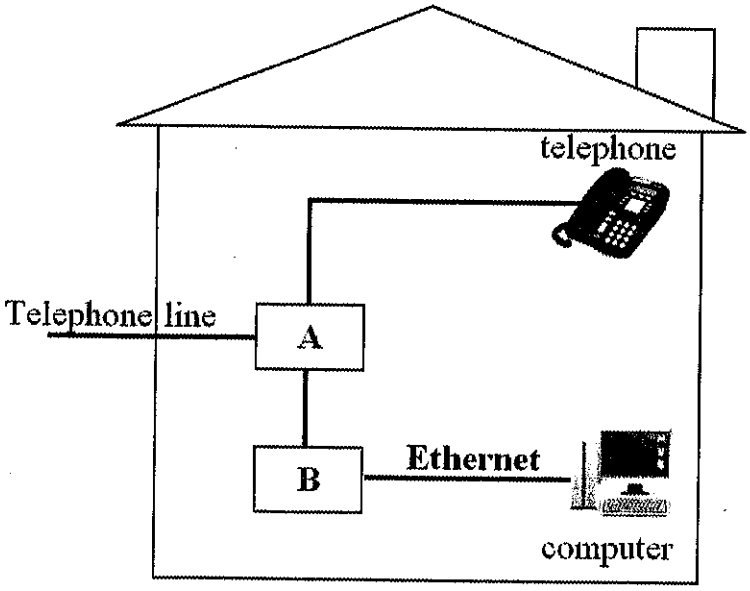
4. (a). A part of the ADSL equipment configuration in a house is shown below.



i. What is labeled as **A** and what is the main purpose of **A**?

[3 marks]

ii. What is labeled as **B** and what is the main purpose of **B**?

[3 marks]

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iii. What is the guided media type we use in the Ethernet cable? Write down one advantage and one disadvantage of it over fiber cables.

[3 marks]

iv. What is the name of the connector that uses to connect Ethernet cable to a computer?

[1 marks]

v. What is the reason to have an asymmetric bandwidth distribution in ADSL?

[3 marks]

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(b). Complete following table with respect to 1G, 2G, 3G and 4G in mobile telecommunication. Examples are given.

	1G	2G	3G	4G
Main focus	**P**	Digital Voice	**Q**	**R**
Main multiplexing method used	**S**	**T**	**U**	OFDM

i. What is labeled as **P**?

[1 marks]

ii. What is labeled as **Q**?

[1 marks]

iii. What is labeled as **R**?

[1 marks]

iv. What is labeled as **S**?

[1 marks]

v. What is labeled as **T**?

[1 marks]

vi. What is labeled as **U**?

[1 marks]

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(c). What is the purpose of having twists in UTP cables?

[3 marks]

(d). Li-fi (using visible light to connect) is an upcoming network connectivity method which is promising to offer a high speed. Write down one advantage of Li-fi over Wi-fi in terms of the security of the network.

[1 marks]

(e). At much lower altitudes, between the two Van Allen belts, we find the **MEO (Medium-Earth Orbit)** satellites. In todays world, what is the main use of the MEO satellites?

[2 marks]

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