

THE OPEN UNIVERSITY OF SRI LANKA  
 B.Sc. DEGREE PROGRAMME: LEVEL 05  
 DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE  
 FINAL EXAMINATION 2012/2013  
**CPU3245 – COMPUTER NETWORKS AND SECURITY**  
**DURATION: Three Hours (3 hours)**




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**Date: 13/12/2013**

**Time: 1.30 pm – 4.30 pm**

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Answer **FOUR** Questions **Only**

### QUESTION 1

- 1.1) Describe the difference between *mesh topology* and *star topology* in the context of computer networks.
- 1.2) Describe the operation of ADSL technology over POTS. Why the upload speed is less than the download speed of an ADSL link?
- 1.3) Describe the difference between the operation of a network router and the operation of a network switch.
- 1.4) A 4 GB file is hosted in a web server of a company head office which is having 10Mbps link. Kandy and Matara branches are having 6Mbps links in each site. Jaffna link size is 3Mbps. No other operations are taking place in the above links. Kandy starts downloading the file first. After 10 seconds elapsed, Matara starts downloading the same file. Jaffna starts downloading the file after 30 seconds. Load balancing at the Colombo link happens by adjusting equal share of total bandwidth for each connection request. Calculate the time in seconds to download the above file in Kandy, Matara and Jaffna.

### QUESTION 2

- 2.1) List three (3) benefits of the layered model in communications.
- 2.2) Explain the two techniques the *bit stuffing* and the *byte stuffing* that are used in determining the start and the end of a data frame.
- 2.3) Draw the TCP Header and explain each section in the header.
- 2.4) How many bits are present in a MAC address of a network interface card (NIC) ? What is the command to obtain the MAC address of a NIC in the command prompt of a Windows 7 PC?
- 2.5) Calculate the hamming distance between 10110111, 11001101 bit strings.

### QUESTION 3

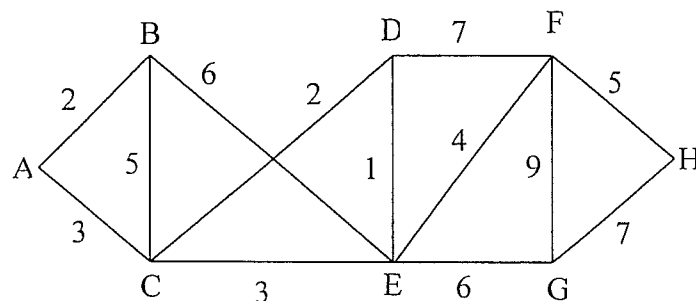
- 3.1) Explain the operation of the CSMA/CD protocol.
- 3.2) Draw the IP header and briefly explain the sections of it.
- 3.3) ABC company has several branches and PCs (number given within brackets) located in Colombo (289), Kandy(144), Mathara(69) and Baticalloa(15). Company is having plans of opening a branch in Anuradhapura (36) as well. An IP address of the main IP block of the company is given as 123.110.149.120/20.

Answer the following;

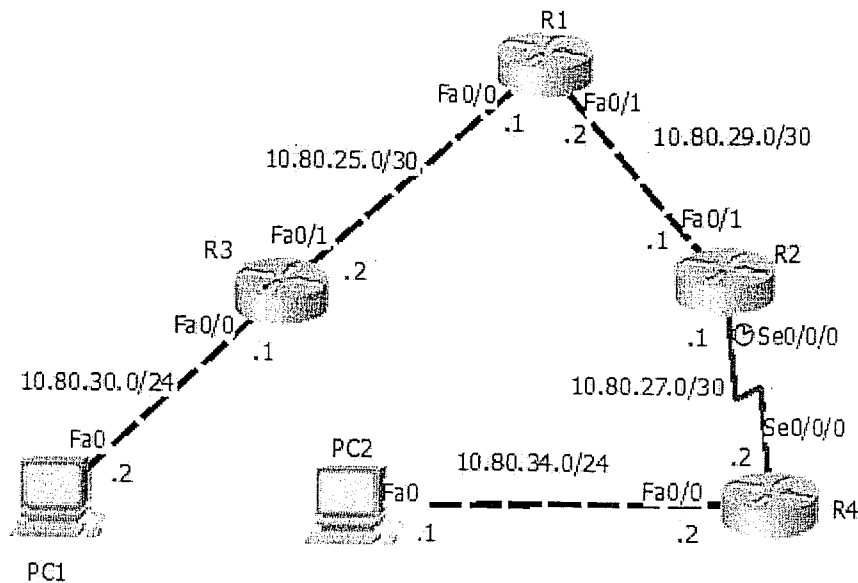
- a) Find the Network address of the main IP block of the company. What is the maximum number of hosts that could be accommodated for the company without breaking down into sub networks.
- b) Subnet the given network (based on the answer of 3.3.a) to all the existing and proposed branches. Provide the network address, subnet mask, starting host address and the broadcast address of each subnet allocated to a particular branch.
- c) Suppose the Kandy branch has to be further subnetted into 3 departments namely HR, academic and administration each having the same number of PCs. Based on the answer of 3.3.b give the network address, starting host address and ending host address of each department in the Kandy branch.

### QUESTION 4

- 4.1) What is the difference between *packet switching* and *circuit switching* in the context of computer networks?
- 4.2) Calculate the shortest path from Node A to Node H using the Dijkstra algorithm. Draw diagrams to show node traversal path and intermediate calculations done at each node. A-H are the router node labels and numbers are the distance between the nodes.



- 4.3) Use the following topology and information provided to answer the rest of the question. The .1 or .2 shown close to each interface of the equipment is the last octet number of the IP address assigned to each interface. Always assume that you are at the USER mode login prompt. Give appropriate commands to be entered in the console for each of the routers.



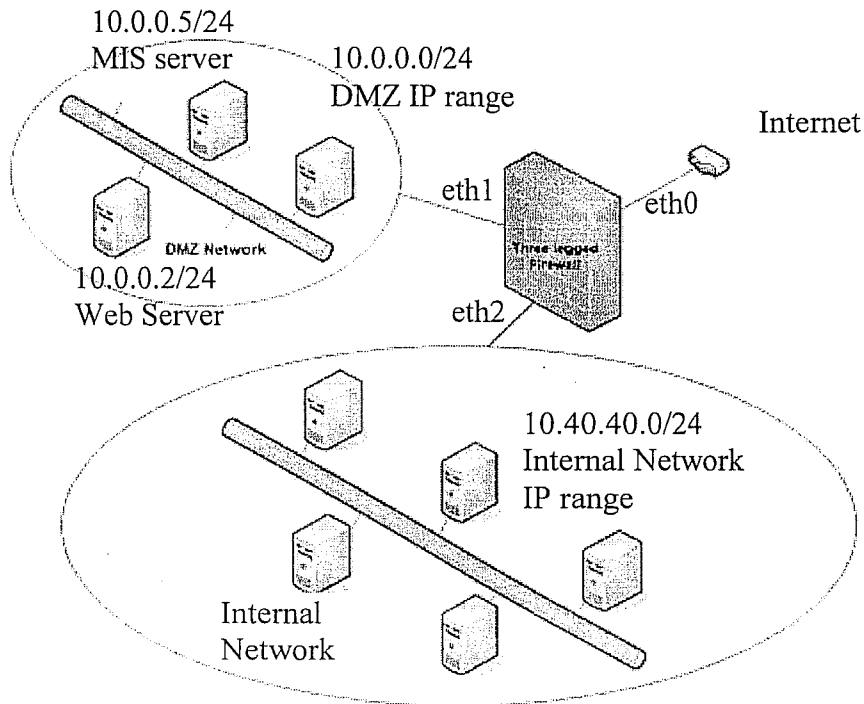
- Write commands to set the hostname of the Router 4 to R4.
- Configure R1 console password to *gopastme* and the login banner to "*hi this is admin router*".
- Give the command to list all the IP addresses that you assign for router interfaces in a specific router.
- Configure static routing in all the routers.

## QUESTION 5

- What is the type of record that should exist in a DNS server related to a particular domain for an institutional Email server to receive mail properly?
- List the series of Linux commands that are required to install apache web server in a CENTOS Linux server and make it run at the startup using a terminal.
- Explain the operation of the following IP tables command. \ is used to write the command in two lines.

```
iptables -A INPUT -p tcp --syn -m limit --limit 5/s \
-i eth0 -j ACCEPT
```

- 5.4) Use the following topology to construct proper firewall configuration rules for the "Three legged firewall". Default policy is set to deny all traffic in all the interfaces of the firewall.



- Allow the access to MIS server web interface on port 8080 and remote desktop service on port 3389 from the internal network.
- Prohibit all access from any IP from the Internet to the MIS server.
- Allow secure shell operation only from any host of the internal network to any host of the DMZ network.
- Allow Webserver to be accessed from the internal network as well as from the Internet.

## QUESTION 6

- Explain the terms *scope*, *reservation* and *exclusion* in a DHCP server.
- Explain the methodology of TCP connection release using appropriate diagrams.
- Explain in steps how RSA algorithm is used in the public/private key mechanism.
- Decode the following cipher text to plain text using *transposition cipher*. Use the key "naughtykid".

ht4dsobb3mantlshpeupueoeltrtdurcacanponcinta2etnacfrlwefec5wbtoocfiedi

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