THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. DEGREE PROGRAMME: LEVEL 05
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
FINAL EXAMINATION 2014/2015
CPU3245 – COMPUTER NETWORKS AND SECURITY
DURATION: Three Hours (3 hours)

Date: 02/11/2015 **Time: 1.30 pm – 4.30 pm**

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

QUESTION 1

1.1) Give the color codes of both sides of a UTP cable which is required to connect a router to a PC.

1.2) List the maximum cable length supported for 10base2, 10base5 and Coaxial cabling used in a computer network

1.3) Explain *simplex, half duplex* and the *full duplex* modes in communications.

1.4) Why the ADSL connection has different upload and download speeds? Explain your answer with suitable diagrams.

1.5) A server has a data transfer rate of 600Mbps. Wireless access point connected to the server has a maximum data transfer rate of 400Mbps. Suppose four clients are connected at the same time to the server using wireless link to download a 20GB file. Due to an electrical interference, two clients go offline for 10 seconds at the start of every 30 seconds after the first 30 seconds. All the clients are having equal priority for the distribution of data rate. Calculate the time required to download file to a client which is not having an electrical interference.

QUESTION 2

2.1) Compare *p-persistent* and *non-persistent* protocols.

2.2) Explain the functionality of the *simplex stop and wait* protocol and the *sliding window* protocol.

2.3) Draw IP header and explain the task of each field in the header.

2.4) A message sized 16384 bytes has to be sent over an Ethernet communication channel. The channel has the default maximum transferable unit size (MTU), TCP and IP header lengths. In addition, each segment has an overhead of 10 bytes per segment. Calculate the minimum number of segments required to transfer the above message. State your assumptions.

QUESTION 3

3.1) Explain the e-mail sending and receiving operations of an institutional e-mail server that has both PC and web based e-mail clients. Your explanation must include the relevant protocol names.

3.2) Explain the TCP connection termination process using appropriate diagrams.

3.3) List the public and the private address ranges of the IP classes in the IP version 4

3.4) Palitha travels company has several branches and PCs (number given within brackets) located in Gampola (500), Kuliyapitiya (110), Batticaloa (60), Galle (135) and Badulla (18). An IP address of the main IP block of the company is given as 120.40.130.100/21.

Answer the following;

a) Find the Network address of the main IP block of the company.

b) Subnet the given network (based on the answer of 3.4.a) to all the branches. Provide the network address, subnet mask and the broadcast address of each subnet allocated to a particular branch.

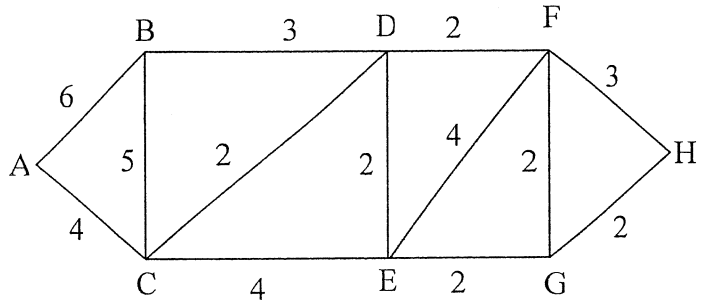
c) Suppose the Galle branch has to be further sub-netted into 3 departments namely admin, HR and finance each having the equal number of PCs. Based on the answer of 3.4.b, give the network address, starting host address and ending host address of the each department in the Galle branch.

QUESTION 4

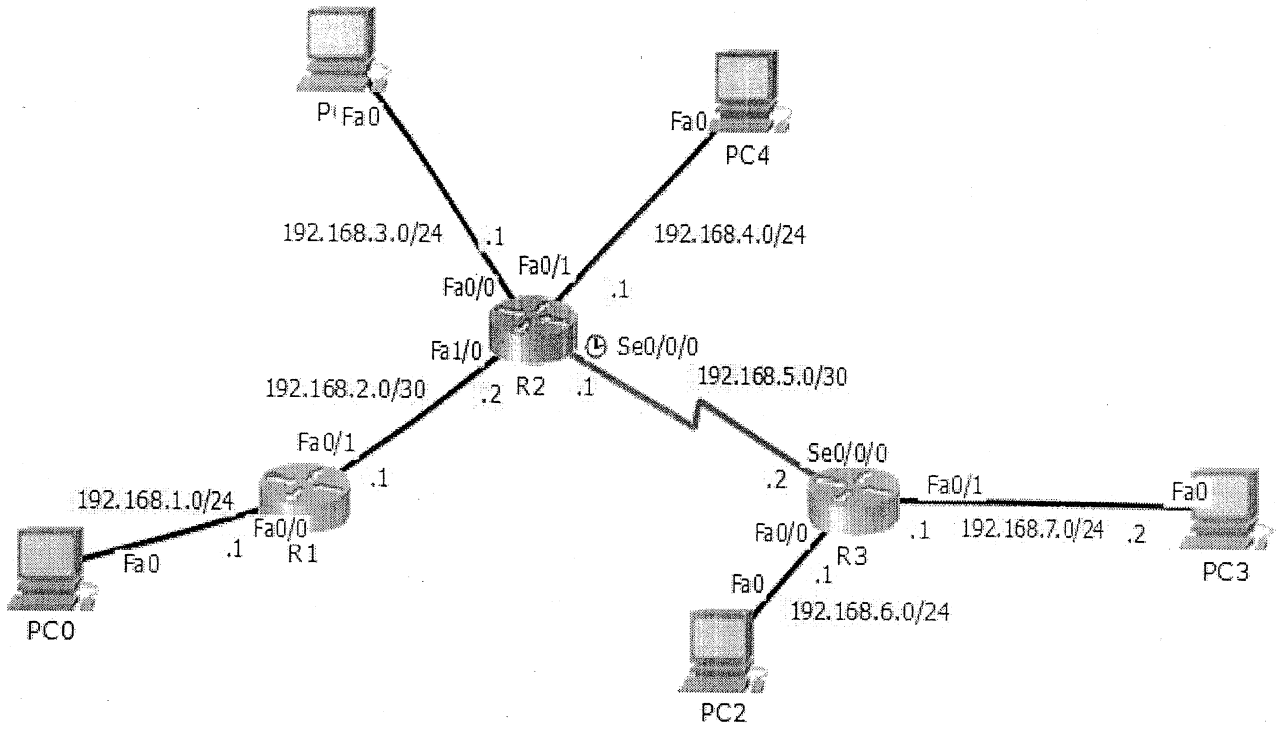
4.1) What is the difference between *Adaptive* and *Non-Adaptive* routing algorithms?

4.2) Explain the *milk* and *wine* packet discarding strategies in congestion control of a computer network.

4.3) 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.



4.4) 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 router 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.



a) Configure R1 console password to *cantloginwithoutme* and the login banner to "*admin router- authorized users only*".

b) Write commands to configure static routing in all the routers.

QUESTION 5

5.1) What is an address pool of a DHCP server? Explain the terms *reservation* and *exclusion* related to a DHCP server.

5.2) What are the functionalities of the following types of records in a DNS ?

a) CNAME record
b) SOA record
c) MX record

5.3) Explain the three generations of firewalls and their functionalities.

5.4) Explain the operation of the following commands used in an IP tables firewall. The symbol \ is used to indicate the continuation of command to the next line.

a)
```
iptables -A INPUT -p tcp --syn -m limit --limit 10/s \
    -i eth1 -j ACCEPT
```

b)
```
iptables -A FORWARD -s 10.16.2.0/26 -i eth0 -d 192.168.10.8 \
-o eth1 -p TCP --sport 1024:65535 --dport --multiport -m \
multiport --dports 25,110 -j DROP
```

c)
```
iptables -A FORWARD -s 10.73.4.0/23 -i eth0 -d 192.168.5.5 \
-o eth1 -p TCP --sport 1024:65535 --dport 22 -j ACCEPT
```

QUESTION 6

6.1) Name a network monitoring tool that you can capture and view the content of a packet in a computer network.

6.2) List the four steps of RSA key generation.

6.3) Explain in steps how public/private key mechanism is used to verify sender and the receiver.

6.4) Decode the following cipher text to plain text using *transposition cipher*. Use the key "flashdrive".

ypueppnslucrvhirweeeesuanlynaaicydncloalueatseichjnhstiwssitfioisiaulsateets isfcohhdohdutbditroehins