



# UNIVERSITY OF RUHUNA

## Faculty of Engineering

End-Semester 5 Examination in Engineering: August 2014

Module Number: EE5315

Module Name: Digital Communication and Computer Networking

[Three Hours]

[Answer all questions, each question carries 10 marks]

---

- Q1 a) Explain briefly how the Virtual Local Area Networks (VLANs) are used to simplify the network management by using an example. [2.0 Marks]
- b) The ports of a switch are assigned to a VLAN. What is the effect of adding the ports to a new VLAN? [2.0 Marks]
- c) In a network, the IP phones are also installed together with the computers. It is required to isolate the traffic of IP Phones from the traffic of computers in order to provide more security. Describe the technology and the devices are used in this network. [2.0 Marks]
- d) The processes on host  $A$  and host  $B$  are assigned to the port  $p$  and port  $q$  respectively. Is it possible to have two or more TCP/UDP connections between these two ports at the same time? [2.0 Marks]
- e) Compare and contrast the followings. [2.0 Marks]
- TCP header and UDP header.
  - Three-way handshaking and three-way hand shaking with the timer in connection release.
- Q2 a) Kisco Ltd. is supposed to introduce a new network equipment. You are asked to design and implement a router which supports the Internet Protocol Version 4 (IPv4).
- Which header fields of the IPv4 header must be updated before a packet is sent by the router?
  - The router needs to add a 4-byte option for some IPv4 packets. What are the additional header fields (which are not been mentioned in part a) i) required?
  - It is found that the router prototype does not read or write the time-to-live field. What is the proper way to handle the time-to-live field?

[3.0 Marks]

b) Summarize the followings into single summary routes.

- i) 192.168.0.0/30  
192.168.0.4/30  
192.168.0.8/30  
192.168.0.16/29  
192.168.4.0/30  
192.168.5.0/30  
192.168.6.0/30  
192.168.7.0/29
- ii) 192.168.68.0/24  
192.168.96.0/24  
192.168.80.0/24

[3.0 Marks]

c) You are asked to design an IP address scheme for your new remote office. The vice president of the IT section informed that you will be in charge of 192.168.1.64/26 sub-network. It is required to have atleast four subnets with 14 hosts in each subnet.

- i) What is the subnet mask you could use?
- ii) State the network id, the usable host IP addresses and the broadcast IP address of one sub-network created in part c) i).

[2.0 Marks]

d) An IP address is given with a prefix of /22. How many additional subnets can be created, if a Variable Length Subnet Mask (VLSM) of /27 is used?

[2.0 Marks]

Q3 a) You are the network administrator of the company ABC. The users in the company are willing to use new network applications. State the service requirements of the following applications.

- i) Video conferencing
- ii) e-commerce application
- iii) Instant messaging
- iv) Email application

[4.0 Marks]

b) State the type of transport layer protocols used for the applications mentioned in part a).

[2.0 Marks]

c) Use the HTTP request message shown in Figure Q3 to describe the followings.

- i) The type of method of the HTTP request
- ii) The importance of the method provided in part c) i).
- iii) The meaning of the User-Agent of the request message.
- iv) The HTTP version used.

[2.0 Marks]

```

POST http://www.themanualpage.org/http/form.php HTTP/1.0
Date: Tue, 15 Nov 1994 08:12:31 GMT
User-Agent: Mozilla/4.03 [fr]
Content-Type: application/x-www-form-urlencoded
Content-Length: 48

name=foo&age=23&country=United+States+of+America

```

Figure Q3: HTTP request message.

- d) "The File Transfer Protocol (FTP) is used to transfer files between incompatible computer systems. It is built on the client-server architecture and uses separate control and data connections between the client and the server. The FTP client sends the user credentials over the control connection. When the user requests a file transfer, FTP opens the TCP data connection. The service type used by IP in the data connection is the maximized throughput while IP uses a minimized delay type service in control connection."

What is meant by "minimized delay type service" in the above description?

[2.0 Marks]

- Q4 a) i) Decrypt the following message using the symmetric key in Table Q4.

qrrbsch gygkq tpkir gsgr tq

Table Q4: Symmetric key.

Plain-text letter	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
Cipher-text letter	k	e	i	o	r	m	n	u	s	v	a	p	q	c	f	t	w	j	y	b	g	l	z	h	x	d

- ii) What is the difference between the symmetric and the asymmetric cryptography?
- iii) What are the desirable secure properties achieved using symmetric and asymmetric encryption algorithms?
- [4.0 Marks]
- b) i) State the three different filtering mechanisms used in firewalls.
- ii) What is the filtering mechanism used, if you want to filter the "ping" packets of the network?
- [2.0 Marks]
- c) You are the network administrator of your University. You are asked to implement the end point security in the network. Explain how you achieve this.
- [2.0 Marks]
- d) Discuss how the AAA concept is implemented in an online banking system.

[2.0 Marks]

Q5 a) The following steps are used to describe the delivery process of an email which is sent to bob@bmail.com from alice@amail.com. The steps are not in correct order. Re-order them in the correct arrangement to describe the delivery process precisely.

- (A) The SMTP server resolves the recipient's name and the email domain.
- (B) The bmail SMTP server hands it over to the POP3 server of bmail to send it to the recipient. The POP3 server maintains a collection of text files for bob's email account. The received email is appended at the end of the text files.
- (C) Bob checks his mail by connecting to the mailbox in the POP3 server. The POP3 server verifies the credentials of Bob.
- (D) Alice's email client interacts with the SMTP server to handle sending. The email client provides the sender's and recipient's email addresses to the server.
- (E) As the recipient resides on another domain, the SMTP server connects to the closest DNS server to resolve the IP address of the bmail.com email server.
- (F) The SMTP server at amail.com connects with the SMTP server at bmail.com and handovers the email.
- (G) When Bob authenticates successfully, the POP3 server allows Bob to read his email.

[2.0 Marks]

- b) i) An email message consists of two major sections. Briefly explain.  
ii) What is purpose of using MIME (Multipurpose Internet Mail Extension) in email messaging?

[2.0 Marks]

- c) i) Explain the role of the Domain Name server (DNS) in Internet?  
ii) Explain the differences between the recursive resolution and the iterative resolution in the name address resolution.  
iii) Explain how the caching technique is used to reduce the searching time in a domain name resolution query.

[4.0 Marks]

- d) i) Explain the advantages of using DHCP (Dynamic Host Configuration Protocol) to configure client machines in a network over manual configuration.  
ii) Explain the steps in the "DORA" process of DHCP.

[2.0 Marks]