UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 5 Examination in Engineering: July 2016

Module Number: EE5302 **Module Name: Computer Networks**

[Three Hours]

[Answer **all questions**, each question carries **10 marks**]

Q1 a) Compare peer-to-peer and client-server network types in computer networking.

[2 Marks]

b) Figure Q1 I) and Figure Q1 II) illustrate two network topologies used in data networks. Explain the importance of both these topologies for data networks considering the different functionalities assigned for corresponding layers in the Transmission Control Protocol / Internet Protocol (TCP/IP) suite.

[3 Marks]

c) i) A network offers packet switching facilities with following network parameters.

   Number of hops between two end systems $(N) = 5$
   Message length $(M) = 3200$ bits
   Data rate $(R) = 9600$ bits per second
   Packet size (P) (only data bits) $= 1024$ bits
   Average call setup time including the queuing delay $= 0.5$ seconds
   Overhead bits per packet $= 56$

   Determine the end-to-end delay in packet switching, stating all the assumptions.

   Hint: The forwarding delay in a packet switched network when the data transfer rates between nodes are non-uniform, is

   $$T_f = (N-1)(T_q + T_m) + P(N+1)\left(\frac{1}{R_1} + \frac{1}{R_2} + \ldots + \frac{1}{R_{N+1}} \right)$$

   where T_q and T_m denote the average queuing delay and the average processing delay respectively.

   ii) Virtual circuit switching is used to select a dedicated path for data transferring in a packet switched network. Determine the time is required to transfer data in that circuit switched path using the same parameters provided in part i). Assume that the time taken by a node to append the entries in its routing table is 0.2 seconds.

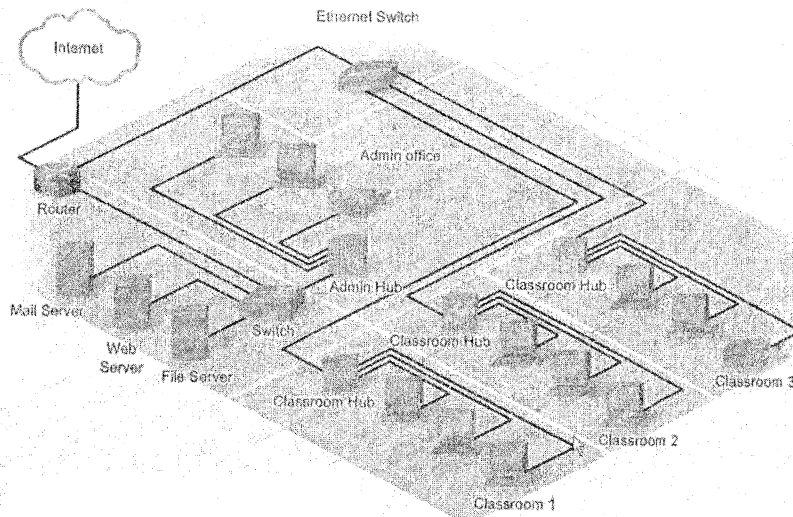   iii) Comment on the two results obtained in part i) and ii).
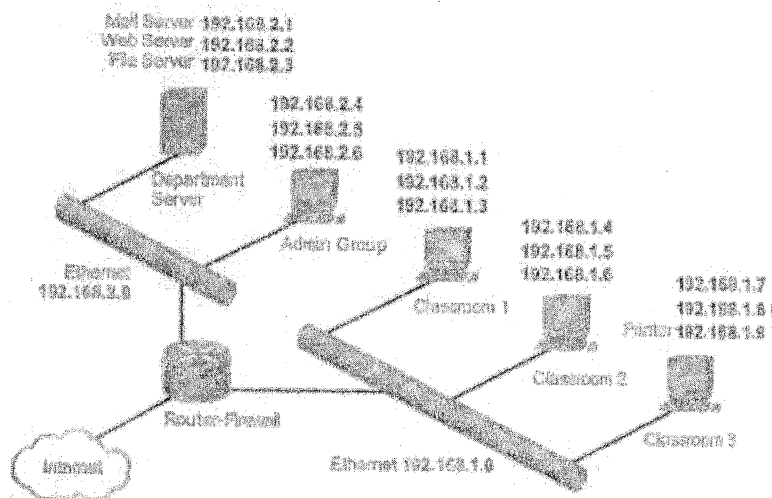
[5 Marks]

Figure Q1 I)

Figure Q1 II)

Q2 a) i)   Explain the requirement for Media Access Control (MAC) in Local Area Networks (LANs).

ii) Briefly explain the two basic media access control methods that can be used for a shared media.

[3 Marks]

b) i)   State the two basic functions provided by the Address Resolution protocol (ARP).

ii) Illustrate the ARP process to send data from Host A to Host D locally in an Ethernet network assuming that there is no ARP entry for Host D in the ARP table of Host A.

[3 Marks]

c) Answer the following questions based on source and destination MAC addresses along with the information provided from the MAC table of Cisco Catalyst 2950 Switch given in Figure Q2.
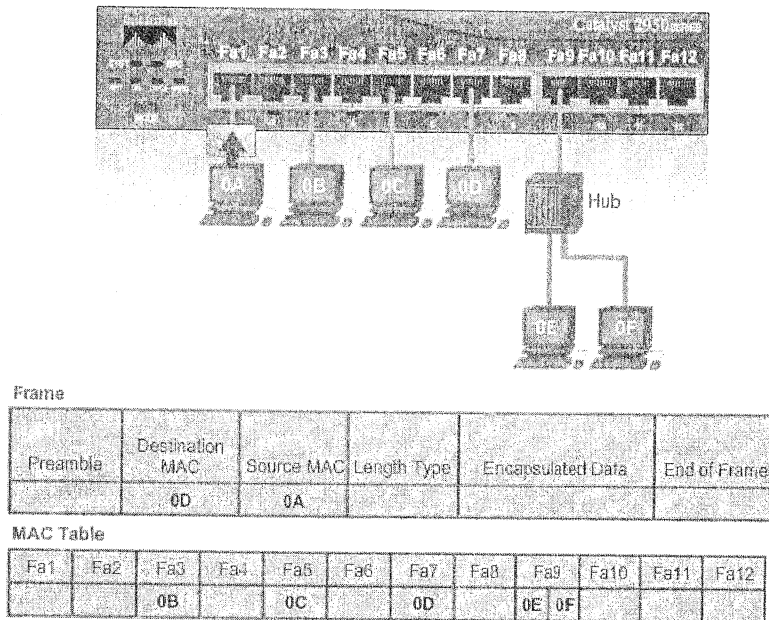

Frame

Preamble	Destination MAC	Source MAC	Length Type	Encapsulated Data	End of Frame
	0D	0A			

MAC Table

Fa1	Fa2	Fa3	Fa4	Fa5	Fa6	Fa7	Fa8	Fa9	Fa10	Fa11	Fa12
		0B		0C		0D		0E	0F		

Figure Q2

i) Where will the switch forward the frame?
ii) What will happen when the switch forwards the frame?

[4 Marks]

Q3 a) Explain the four basic functions of the Network layer in the TCP/IP protocol suite.

[3 Marks]

b) Discuss the benefits of Variable Length Subnet Masks (VLSM) over conventional subnetting of a local IP network.

[2 Marks]

c) Suppose that you have given a Class C network address 192.168.10.0/24 and asked to divide it into three sub-networks each with unequal number of hosts' requirement as shown below.
   Subnet A: 61 Hosts
   Subnet B: 23 Hosts
   Subnet C: 7 Hosts

i) For each subnet, list the required hosts, possible hosts, network address and broadcast address.

ii) Determine the number of IP addresses which can be saved with this approach over conventional subnetting.

[5 Marks]

Q4 a) i)   State three different methods employed by the transport layer of TCP/IP protocol suite for reliable delivery of segments.

ii) Use a diagram to explain the Transitional Transmission Control Protocol (TCP) release process.

iii) Compare TCP and User Datagram Protocol (UDP) technologies.

[3 Marks]

b) A host PC running on MS windows operating system is accessing 'Google' and 'Facebook' websites while listening to a music video played in a 'YouTube' tab opened in the same web browser.

i)   Describe the procedure in which the host PC is sending and distinguishing the arrived packets in order to process.

ii) If there are two active 'Facebook' chat application windows are operating, explain the methodology which is used to distinguish the data processed at the two windows.

[3 Marks]

c) Figure Q4 I) and Figure Q4 II) illustrate the details of two packets which were captured by Wireshark software.

i)   Write the protocols of the source and destination ports and their numbers of the captured packets.

ii) What significant difference is observable on the layer 3 level of the two packets?

iii) How many routers being passed by the packet illustrated in Figure Q4 II) when reaching the destination?

iv) What is the header size of the segment depicted in Figure Q4 I)?

v)   A sequence number is not mentioned in the packet in Figure Q4 I). Explain why?

[4 Marks]

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⊞ Frame 3991: 718 bytes on wire (5744 bits), 718 bytes captured (5744 bits) on interface 0
⊟ Ethernet II, Src: HonHaiPr_dc:b6:89 (74:29:af:dc:b6:89), Dst: IPv6mcast_0c (33:33:00:00:00:0c)
   ⊞ Destination: IPv6mcast_0c (33:33:00:00:00:0c)
   ⊞ Source: HonHaiPr_dc:b6:89 (74:29:af:dc:b6:89)
     Type: IPv6 (0x86dd)
⊟ Internet Protocol Version 6, Src: fe80::65ff:b5ca:697:9888 (fe80::65ff:b5ca:697:9888), Dst: ff02::c (ff02::c)
   ⊞ 0110 .... = Version: 6
   ⊞ .... 0000 0000 .... .... .... .... .... = Traffic class: 0x00000000
     .... .... .... 0000 0000 0000 0000 0000 = Flowlabel: 0x00000000
     Payload length: 664
     Next header: UDP (17)
     Hop limit: 1
     Source: fe80::65ff:b5ca:697:9888 (fe80::65ff:b5ca:697:9888)
     Destination: ff02::c (ff02::c)
     [Source GeoIP: Unknown]
     [Destination GeoIP: Unknown]
⊟ User Datagram Protocol, Src Port: 59196 (59196), Dst Port: 3702 (3702)
     Source Port: 59196 (59196)
     Destination Port: 3702 (3702)
     Length: 664
   ⊟ Checksum: 0xd6c5 [validation disabled]
        [Good Checksum: False]
        [Bad Checksum: False]
     [Stream index: 1]
⊞ Data (656 bytes)
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Figure Q4 I)

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⊞ Frame 121: 1454 bytes on wire (11632 bits), 1454 bytes captured (11632 bits) on interface 0
⊞ Ethernet II, Src: HuaweiTe_dc:67:90 (e8:08:8b:dc:67:90), Dst: HonHaiPr_dc:b6:89 (74:29:af:dc:b6:89)
⊟ Internet Protocol Version 4, Src: 185.120.146.81 (185.120.146.81), Dst: 192.168.1.2 (192.168.1.2)
    Version: 4
    Header Length: 20 bytes
  ⊞ Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00: Not-ECT (Not ECN-Capable Transport))
    Total Length: 1440
    Identification: 0x4ce4 (19684)
  ⊞ Flags: 0x02 (Don't Fragment)
    Fragment offset: 0
    Time to live: 49
    Protocol: TCP (6)
  ⊞ Header checksum: 0xe9ff [validation disabled]
    Source: 185.120.146.81 (185.120.146.81)
    Destination: 192.168.1.2 (192.168.1.2)
    [Source GeoIP: Unknown]
    [Destination GeoIP: Unknown]
⊞ Transmission Control Protocol, Src Port: 8777 (8777), Dst Port: 58488 (58488), Seq: 109201, Ack: 1, Len: 1400
⊟ Data (1400 bytes)
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Figure Q4 II)

Q5 a) i) State the difference between recursive resolution and iterative resolution in Domain Name System (DNS) resolving.

ii) Illustrate the hierarchy of the domain spaces for the following Uniform Resource Locator (URL).
http://eie.eng.ruh.ac.lk/education.html

iii) What is the difference between a DNS and a Network Address Translation (NAT)?

[4 Marks]

b) i) What are the disadvantages of non-persistent Hyper-Text Transfer Protocol (HTTP) connections compared to persistent HTTP connections?

ii) Following HTTP methods and responses are used to establish a connection between a server and a client to transfer data.

GET, CONNECT, 200 OK, 401 Authorization Request and HEAD

If the web client establishes a persistent connection with the server before requesting the corresponding web page, arrange the above methods and responses in the correct order to represent the data transfer process.

[3 marks]

c) i) Describe the AAA (Authentication-Authorization-Accounting) concept related to information system security.

ii) How does a firewall protect our computer network?

[3 Marks]