Faculty of Engineering	Second Term 2012/2013	3rd year ECE Final Exam
Electronics&Communications Eng. Dept.	Time: 3 Hours	Elective Course 2 Communications Networks

Attempt ALL questions. Assume any missing data.   **(Total 70 Marks=5 x 14 Marks)**

Q.1.a) Millions of users are connected to the Internet through thousands of access ISPs. Discuss in short notes using neat sketches, how the Internet is structured to connect access ISPs together to offer a large virtual Network of Networks.

  b) The CSMA/CD protocol is the public protocol used in wired shared media multiple access networks to manage the access of stations to the media. By aid of neat sketches, discuss the operation of CSMA/CD operation.

  c) A local area network (LAN) uses 10 Mbps Ethernet Standard with CSMA/CD mechanism which has one-way signal propagation time of 51.2 µs (slot time).
  i. What is the minimum transmitted frame length (bits)?
  ii. If a station transmits frames with minimum frame size repeatedly with waiting IGP time of 12.8 µs between frames; Calculate the average bandwidth used by the station?.

Q.2.a) Draw a diagram to illustrate the components of a general ATM network and explain their functions and compare between the protocols used to communicate between them.

  b) Compare between Ethernet and ATM network technologies on the following basis:
  i) Their communication reference model   ii) Services supported

  c) If an ATM switch of size 8x8 ports is to be built using either Banyan or Crossbar switching, compare between both designs on the basis of:
  i)   The required number of switching elements used
  ii) Number of switching stages needed
  iii) The cell delay in terms of switching element delay
  iv) The possibility for internal cell blocking problem

Q.3.a) Discuss the reasoning behind the layering approach to network model design.

  b) Draw a diagram to show how a message is passed, using the OSI model, between two user-end systems that are separated by a single Network-layer device.

  c) A host has (IP: 193.227.50.116 and MAC: 00:50:DA:E0:A6:D4) has received an Ethernet packet using http/TCP transport service from a host that has (IP: 163.121.116.16).
  i. Fill-in the spaces and rewrite the complete Ethernet packet below to represent the data given above.   -- -- -- -- -- -- 00 10 7B 47 BB D0 -- -- 45 00
        00 B4 BB 91 40 00 32 -- 80 D1 -- -- -- -- -- --
        -- -- 00 50 0F EA 03 89 EE 0E D9 1A 13 41 50 18
  ii. Find the MAC address of the gateway of the receiving host's network.
  iii. How many hops between the two hosts and what is the OS type of the sender?

Q.4.a) State different IP address classes and how many networks as well as network devices can be exist in each class.

  b) Using neat sketches, explain three methods used to solve the problem of IPv4 address exhaustion.

  c) Consider an ISP with an address space from 182.20.0.0 to 182.20.31.255. How might the ISP allocate addresses to customers if it had 3 customers each with 1000 hosts; and if they were to move to having 5 customers each with 2000 hosts? Calculate the network mask used in both cases.

Q.5.a) List the device(s) in which fragmentation may take place, explaining at what protocol layer fragmentation is performed and explaining the reason why fragmentation is needed.

b) Discuss the main purpose of routing protocols and compare between their main types

c) You have three routers each of them has 3 WAN and one LAN connections. The routers are connected together as well as to their LANs according to the table below. Draw a network diagram illustrating the topology of the network and construct a static routing table (shortest path route).

Router	E0 connected to	S0 connected to	S1 connected to	S2 connected to
R1	LAN 163.12.0.0	R2 at S1	N/A	N/A
R2	LAN 100.0.0.0	Internet	R1 at S0	R3 at S0
R3	LAN 197.10.10.0	R2 at S2	N/A	N/A

Preamble	Destination HA	Source HA	Type	Date	FCS
8 Bytes	6 Bytes	6 Bytes	2 Bytes	46<= Bytes<=1500	4 Byte

Header 1

0	1516	31

Source Port	Destination Port
Length	Checksum
Data	

Header 2

16-bit Source port number	16-bit Destination port number
32-bit Sequence Number	
32-bit Acknowledgment Number	

4-bit header length	6-bit (Reserved)	Flags U R G	A C K	P S H	R S T	S Y N	F I N	16-bit Window size
16-bit TCP Checksum								16-bit Urgent pointer
Option (If any)								
Data (If any)								

Header 3

0	4	8	15 16	19	31

Version	IHL	Type of Service	Total Length	
Identification			Flags	13-bit Fragment offset
TTL		Higher –level Protocol	Header Checksum	
Source Address				
Destination Address				
Options + Data				

Header 4

Ethernet header. Hint: EtherType: (IP:0x0800, ARP : 0x0806)

IP Header: Transport layer protocols types: (TCP:0x6, UDP:0x11, ICMP:0x01)

Good luck   Prof. *Hassan Soliman*