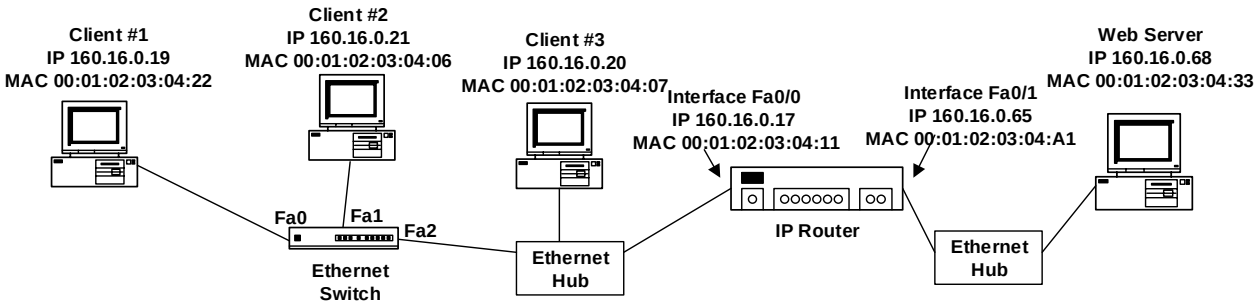
NET 363-501
Homework #1

Due **Thursday, January 21st** by **11:59 pm**

50 points total

Submit your answers to the following questions on D2L in PDF format. You must include your name at the beginning of your answer file (2 point penalty for no name in answer file).



Refer to the network figure above, showing two Ethernet Subnets connected through an IP Router, for questions #1 to #4. For each device interface, both its Internet Protocol (IP) address and its MAC address (also called the Physical address) are shown. The Subnet Mask used by all devices is 255.255.255.248.

1. (3 points) The IP Subnet ID for the right subnet (containing the Web Server) is 160.16.0.64/29. What is the first and last assignable IP address in this subnet?

2. (3 points) If Client #1 wants to send an IP broadcast packet to all devices on the left subnet, what IP destination should it send to? In other words, what is the IP Broadcast address for the left subnet?

3. Assume that Client #1 and Web Server have already completed a TCP 3-way handshake and now Client #1 transmits an HTTP Request packet to the Web Server. What are the specific numeric address values (copied from the diagram above) that will be in each of the following header fields of this packet when it is sent out by Client #1?

   a) (2 points) Source MAC Address in Ethernet header
   b) (3 points) Destination MAC Address in Ethernet header
   c) (2 points) Source IP Address in IP header
   d) (3 points) Destination IP Address in IP header
   e) (3 points) Destination Port Address in TCP header

4. (4 points) Assume that the Web Server wants to send 2 data packets – Packet A and Packet B (in that order) - to Client #1. Packet A is sent with TCP Sequence Number = 2280 and contains 700 data bytes. Packet B contains 1400 data bytes. Assuming no errors, what Sequence Number value will the Web Server put in the TCP header of Packet B (sent right after Packet A)?

5. (3 points) My IP address is 177.39.59.38 and my subnet mask is 255.255.255.224. What are the first and last assignable IP addresses in my subnet?

6. (3 points) My IP address is 177.39.59.38 and my subnet mask is 255.255.248.0. What are the first and last assignable IP addresses in my subnet?

7. Consider the routing table and ARP table below from a Cisco router. This router has two Ethernet interfaces: Ethernet0/0 and Ethernet0/1.

```
Router6>show ip route

C    192.168.10.0/24 is directly connected, Ethernet0/0
R    192.168.11.0/24 [120/1] via 192.168.10.7, 00:00:11, Ethernet0/0
S    192.168.50.0/24 [1/0] via 192.168.1.5
C    192.168.1.0/24 is directly connected, Ethernet0/1
R    192.168.2.0/24 [120/2] via 192.168.10.7, 00:00:11, Ethernet0/0
Router6>show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  192.168.10.7           41   0030.8540.c460  ARPA   Ethernet0/0
Internet  192.168.1.1           206   000d.bd4f.1380  ARPA   Ethernet0/1
Internet  192.168.1.2           212   000d.bd56.2d80  ARPA   Ethernet0/1
Internet  192.168.1.5             4   000c.2983.9ec2  ARPA   Ethernet0/1
Internet  192.168.1.4            10   0015.171d.f3d0  ARPA   Ethernet0/1
Internet  192.168.1.18            1   0015.1780.1bd1  ARPA   Ethernet0/1
Internet  192.168.1.20          206   00c0.b773.867e  ARPA   Ethernet0/1
Router6>
```

a) (4 points) Assume that this router receives a packet with destination IP address 192.168.2.5

   i) Which interface (Ethernet0/0 or Ethernet0/1) will this packet will be sent out?

   ii) What is the value of the Ethernet (MAC) Destination Address in the packet that is sent out? (specify numerical value in hexadecimal, not just a description)

b) (4 points) Assume that this router receives a packet with destination IP address 192.168.1.5

   i) Which interface (Ethernet0/0 or Ethernet0/1) will this packet will be sent out?

   ii) What is the value of the Ethernet (MAC) Destination Address in the packet that is sent out? (specify numerical value in hexadecimal, not just a description)

8. (7 points) Consider a router that has the following Routing Table contents. Note that "0.0.0.0/0" is the notation for the "default route".

Destination Subnet	***Outgoing Interface***	***Next Hop***
50.62.8.0/22	**Fa0/0**	**118.2.77.4**
24.19.66.80/28	**Fa0/1**	**59.16.1.1**
0.0.0.0/0	**Fa0/2**	**18.12.52.43**

a) A packet with destination IP address 50.62.8.249 arrives to this router. Out what interface will this packet be sent?

b) A packet with destination IP address 50.62.11.199 arrives to this router. Out what interface will this packet be sent?

c) A packet with destination IP address 24.19.66.99 arrives to this router. Out what interface will this packet be sent?

9. (6 points) Company A has been allocated the Class B address block 18.169.0.0/16, which contains 65,536 IP addresses. Internally, they have 30 departments, so they want to break this address block into 32 internal subnets of equal size.

a) What Subnet Mask will they use on all internal device interfaces to achieve this?

b) What is the maximum number of devices (each using 1 IP address) that can be deployed in each department subnet before its assignable IP addresses are used up?

c) Out of these 32 subnets, choose any 3 subnets and list the Subnet ID (containing Network Address and Prefix Length) and the first and last assignable host address in each of these 3 subnets.