1. Solve question 6 again if it is provided by network address 165.100.0.0, and the company needed at least 1000 subnets each of them has at least 60 hosts.
   - Address = 165.100.0.0
   - Class B -> Network mask = /16 "default subnet mask"
   - Need 1000 subnets = 10 bits (as 2^10=1024)
   - Custom subnet mask= /(16+10)=/26
   - Number of possible subnets= 2^10 = 1024
   - Total number of hosts per subnet = 2^(16-10)-2=64-2=62 hosts (> 60)
   - Total number of hosts per network= 1024 * 62 = 63,488
   - Without subnetting, number of possible hosts = 2^16 – 2 = 65,534

2. What is Network Address Translation (NAT) and why it is used? Give an example of it.

   - It is a process in which a group of computers that have one or more local IP addresses to be translated to one or more unique Global IP address to allow local host access
   - Examples: One-to-many NAT, Basic-NAT

3. List the advantages and disadvantages of NAT?

Advantages	Disadvantages
• Reuse private IP • Private Network Security can be enhanced by hiding the internal addresses from the external addresses • It helps in reducing the IP address space because many hosts connect to global internet by using a single dynamic external IP	• Delay in switching path while the translation • Some Application in NAT will have compatibility issue • To examine the data packet of the traffic, it convert the local and global IP addresses inside the memory which cause a memory issue

4. What is Port Address Translation (PAT) and in which way it differs from NAT, give an example.

- It is an extension of NAT that make multiple devices on the same LAN to be mapped into one public IP address
- Example: Communication between a group of users with single port

NAT	PAT
• Private IP addresses are mapped into public address • NAT be called PAT's superset • Network Address Translation • Types: Static, Dynamic NAT, Overloaded NAT	• Private IP addresses are mapped into public address through ports • Can be called dynamic NAT • Port Address Translation • Static, Overloaded PAT

5. What is Address Resolution Protocol (ARP) used for? And in which layer it works?

- ARP is (Address Resolution Protocol), this protocol is used to find the hardware address (MAC Address) of a host from a known IP address and this will happen when one device wants to communicate with another device on LAN or Ethernet.

6. What is an ARP request used for, when it is sent? , define its sender and receiver.

- Sent by the sender as a broadcast message to test the presence of the machines on the LAN and find it's MAC address and asks if any of the machines are using that particular IP address. When a machine recognizes the IP address as its own it sends a unicast reply message to the source.

7. What is the difference between ARP and Dynamic Host Configuration Protocol (DHCP)?

- ARP: It represents it translate the IP address to its associated physical address, mostly by sending a piece of information from the source to the destination where the server process is executed, and this info helps identifying the network system and obtain its address.
- DHCP: Dynamic Host configuration protocol which is a network protocol automatically assigns the IP addresses to the computers or other devices on each LAN network, It uses both static or dynamic IP address, The static is manually configured by a computer and it is used when you want your IP address to be unchanged.

8. Give two examples of types of Internet Control Message Protocol (ICMP).

- ICMP Echo request and reply: messages are sent and received by ping commands The Echo Request simply means that the host to which it is addressed should reply to the packet. The Echo Reply is the ICMP message type that should be used in the reply used to test if a machine is a live.
- Traceroute ICMP: Works by sending internet control massage Protocol packets and all routers in this transfer get the packet and this ICMP massages contains information about which routers are involved in these transfer.