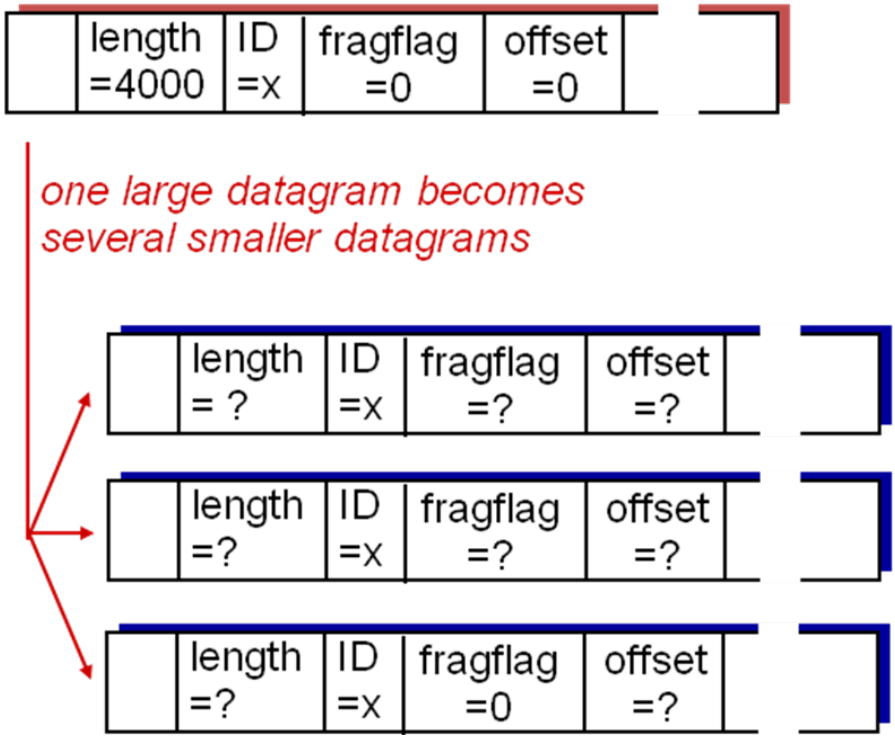
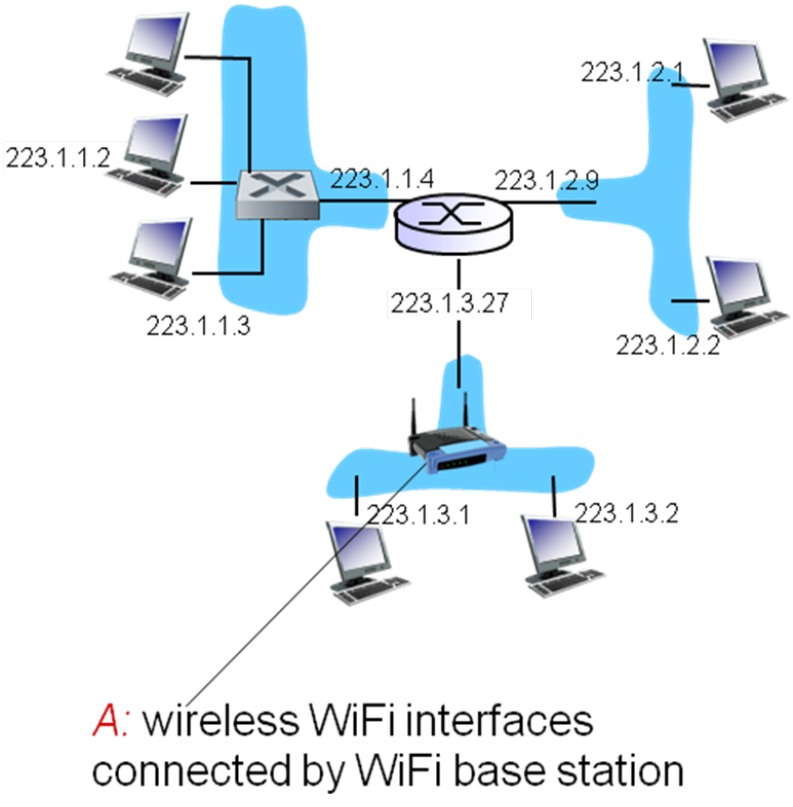
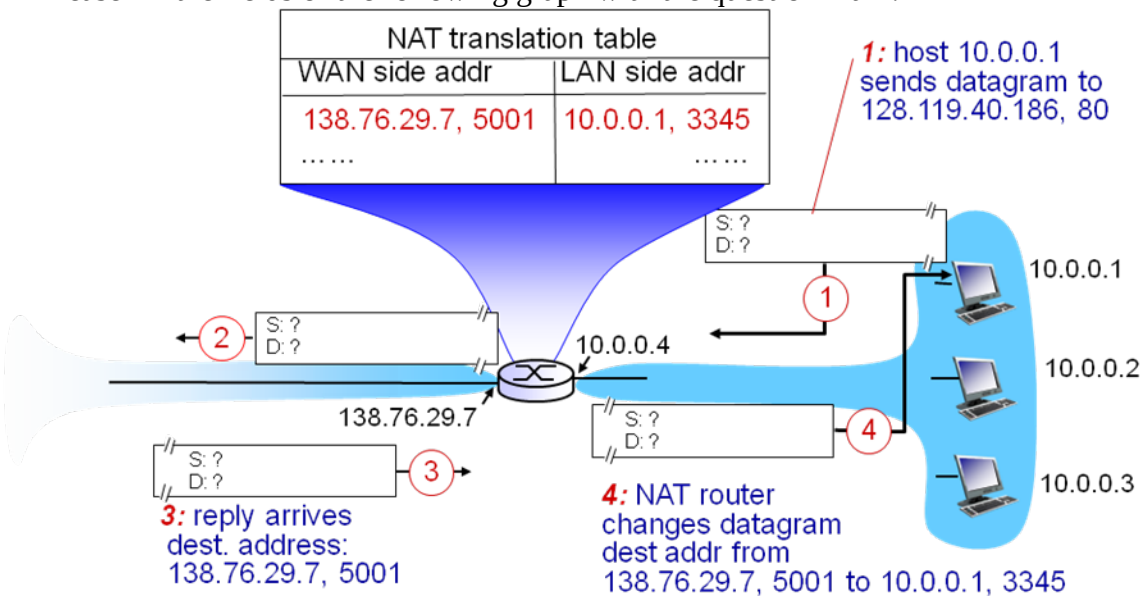
1. A router consists of input ports, high-speed switching fabric, routing processor, and output ports. Please draw a block diagram for a router which include above mentioned modules and explain each module, respectively.
2. What is Head-of-the-line (HOL) blocking? Also explain what is hotspot in a network? And how does butterfly effect occur within a switching fabric?
3. Please fill the fields of the graph with the question mark.



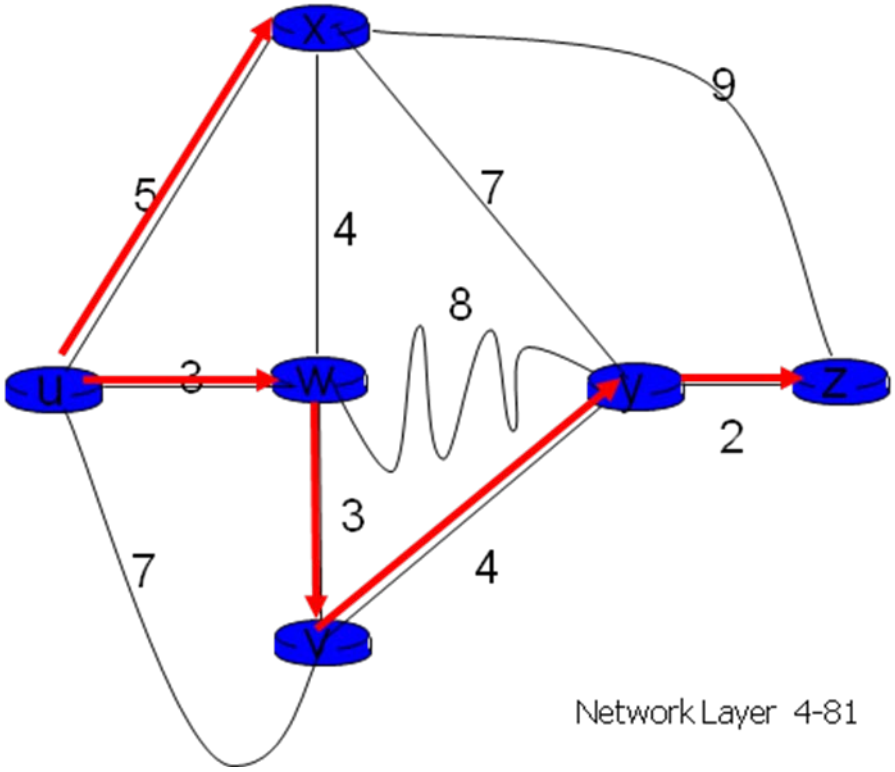
4. From the following graph, please explain what is a subnet? And what is an interface?



5. Please briefly describe how ATM networks classify and achieve different classes of services.
6. Please fill the fields of the following graph with the question mark.



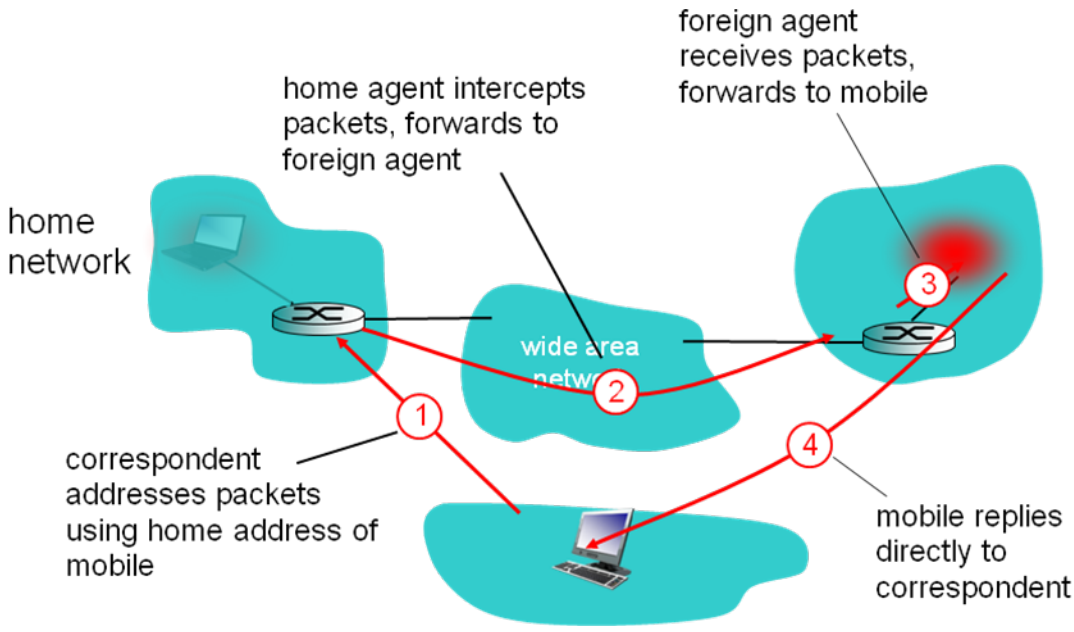
7. Please use the Dijkstra algorithm to construct the routing paths step by step.



8. Please list comparisons of LS algorithm and DV algorithm to some details.
9. Write a pseudo code for Reverse Path Forwarding (RPF) and use a graph example to explain it.
10. Please list four major changes from IPv4 to IPv6 and explain the considering points of making such changes.
11. What is a collision in the MAC layer? Please list four ways to avoid it.

12. Please draw a picture to explain why slotted Aloha is more efficient than unslotted Aloha (pure Aloha).
13. Please explain the operation of DOCSIS (data over cable service interface spec).
14. In the class we describe how to Google a web page in a day in the life of a web request. Please explain it as detailed as you remember.
15. Please write the pseudo code for CSMA/CD. What is CSMA/CA? Please use graph to demonstrate the advantage of using CD and CA, respectively.
16. What is MPLS? The speed of a router can be greatly increase by adopting the MPLS technique compared to the traditional router without adopting the MPLS technique. Why? Is it possible that by adopting the MPLS technique, the router can be as fast as the bridge using the same hardware technology?
17. What is hidden terminal problem and what is exposed terminal problem? Please draw pictures to explain them briefly. Draw a picture to show how RTS and CTS are used in CSMA/CA to avoid collisions.

18. Please explain how to handle mobility on mobile IP and cellular networks, respectively. Please use graphs and list the sequence of messages.
19. 111-11-1-1-1 and 1 -1111-111 are two orthogonal codes or chipping sequences for CDMA. Please use those two codes and draw a graph to show we can transmit two data bits (streams) within the same frequency range and retrieve two data bits (streams) correctly at receivers.



20. For the above graph, if the IP address of correspondent node is A, home network is B, foreign network is C, and care-of-address of the mobile receiver is C.1, please show how encapsulation technique is used to send data from A to C.1 via triangle routing and then C.1 send data to A, respectively.