SASTRA
ENGINEERING - MANAGEMENT - LAW - SCIENCES - HUMANITIES - EDUCATION
DEEMED TO BE UNIVERSITY
(U/S 3 of the UGC Act, 1956)
THINK MERIT | THINK TRANSPARENCY | THINK SASTRA

Assignment - 2

1. A large organization with a large block address (12.44.184.0/21) is split into one medium-size company using the block address (12.44.184.0/22) and two small organizations. If the first small company uses the block (12.44.188.0/23), what is the remaining block that can be used by the second small company? Explain how the datagrams destined for the two small companies can be correctly routed to these companies if their address blocks still are part of the original company.

2. An ISP is granted the block 16.12.64.0/20. The ISP needs to allocate addresses for 8 organizations, each with 256 addresses.
   a. Find the number and range of addresses in the ISP block.
   b. Find the range of addresses for each organization and the range of unallocated addresses.
   c. Show the outline of the address distribution and the forwarding table.

3. An organization is granted the block 130.56.0.0/16. The administrator wants to create 1024 subnets.
   a. Find the number of addresses in each subnet.
   b. Find the subnet prefix.
   c. Find the first and the last address in the first subnet.
   d. Find the first and the last address in the last subnet.

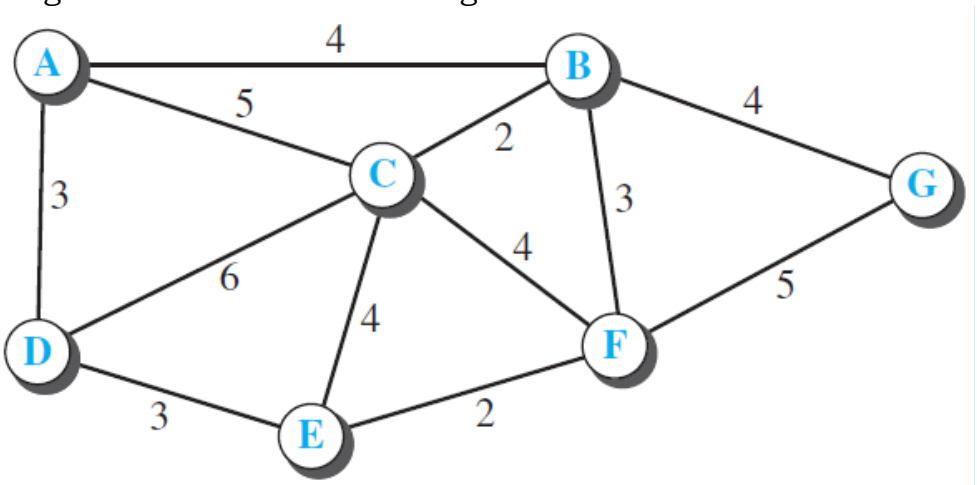
4. Determine if a datagram with the following information is a first fragment, a middle fragment, a last fragment, or the only fragment (no fragmentation):
   a. M bit is set to 1 and the value of the offset field is zero.
   b. M bit is set to 1 and the value of the offset field is nonzero.

5. Assume that the shortest distance between nodes ***a***, ***b***, ***c***, and ***d*** to node ***y*** and the costs from node ***x*** to nodes ***a***, ***b***, ***c***, and ***d*** are given below:

   $\mathbf{D_{ay} = 5}$, $\mathbf{D_{by} = 6}$, $\mathbf{D_{cy} = 4}$, $\mathbf{D_{dy} = 3}$, $\mathbf{c_{xa} = 2}$, $\mathbf{c_{xb} = 1}$, $\mathbf{c_{xc} = 3}$, $\mathbf{c_{xd} = 1}$

   What is the shortest distance between node ***x*** and node ***y***, $\mathbf{D_{xy}}$, according to the Bellman-Ford equation?

6. Use Dijkstra's algorithm to find the shortest path tree and the forwarding table for node A in the Figure



7. Show the unabbreviated colon hex notation for the following IPv6 addresses:
   a. An address with 64 0s followed by 32 two-bit (01)s.
   b. An address with 64 0s followed by 32 two-bit (10)s.
   c. An address with 64 two-bit (01)s.
   d. An address with 32 four-bit (0111)s.

8. A sender sends a series of packets to the same destination using 5-bit sequence numbers. If the sequence numbers start with 0, what is the sequence number of the 100th packet?

9. We can define the bandwidth-delay product in a network as the number of packets that can be in the pipe during the round-trip time (RTT). What is the bandwidth-delay product in each of the following situations?
   a. Bandwidth: 1 Mbps, RTT: 20 ms, packet size: 1000 bits
   b. Bandwidth: 10 Mbps, RTT: 20 ms, packet size: 2000 bits
   c. Bandwidth: 1 Gbps, RTT: 4 ms, packet size: 10,000 bits

10. Assume we need to design a Go-Back-N sliding-window protocol for a network in which the bandwidth is 100 Mbps and the average distance between the sender and receiver is 10,000 km. Assume the average packet size is 100,000 bits and the propagation speed in the media is 2×10^8 m/s. Find the maximum size of the send and receive windows, the number of bits in the sequence number field (m), and an appropriate time-out value for the timer.

11. Assume we need to design a Selective-Repeat sliding-window protocol for a network in which the bandwidth is 1 Gbps and the average distance between the sender and receiver is 5,000 km. Assume the average packet size is 50,000 bits and the propagation speed in the media is 2×10^8 m/s. Find the maximum size of the send and receive windows, the number of bits in the sequence number field (m), and an appropriate time-out value for the timer.

12. Some of the application programs can use the services of two transport-layer protocols (UDP or TCP). When a packet arrives at the destination, how can the computer find which transport layer is involved?

13. A client residing on a host with IP address 122.45.12.7 sends a message to the corresponding server residing on a host with IP address 200.112.45.90. If the well-known port is 161 and the ephemeral port is 51000, what are the pair of socket addresses used in this communication?

14. Assume a private internet uses a protocol suite totally different from the TCP/IP protocol suite. Can this internet still use the services of UDP or TCP as an end-to-end vehicle of message communication?

15. In TCP, we have two consecutive segments. Assume the sequence number of the first segment is 101. What is the sequence number of the next segment in each of the following cases?
    a. The first segment does not consume any sequence numbers.
    b. The first segment consumes 10 sequence numbers.

16. Can you explain why in TCP a SYN, SYN + ACK, and FIN segment each consume a sequence number, but an ACK segment carrying no data does not consume a sequence number?

17. Assume a client sends a SYN segment to a server. When the server checks the well-known port number, it finds that no process defined by the port number is running. What is the server supposed to do in this case?

18. Assume a TCP client is expecting to receive byte 3001. It receives a segment with the sequence number 3001 that carries 400 bytes. If the client has no data to be sent at this moment and has acknowledged the previous segment, what is the reaction of the TCP client to this event? Can you justify the reaction?

19. Assume a TCP server is expecting to receive byte 6001. It receives a segment with the sequence number 6001 that carries 2000 bytes. If the server has bytes 4001 to 5000 to send, what should the reaction of the TCP server be to this event? Can you justify the reaction?

20. In SCTP, a packet is carrying two DATA chunks, each containing 22 bytes of user data. What is the size of each DATA chunk? What is the total size of the packet?

21. In the client-server paradigm, explain why a server should be run all the time, but a client can be run when it is needed.

22. Can you find an analogy in our daily life as to when we use two separate connections in communication similar to the control and data connections in FTP?

23. Both HTTP and FTP can retrieve a file from a server. Which protocol should we use to download a file?

24. The TELNET application has no commands such as those found in FTP or HTTP to allow the user to do something such as transfer a file or access a web page. In what way can this application be useful?

25. FTP uses the services of TCP for exchanging control information and data transfer. Could FTP have used the services of UDP for either of these two connections? Explain.

**********The End**********