Computer Network
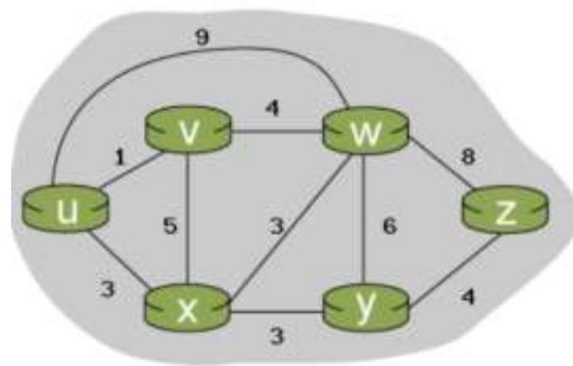
Q1. Explain the meaning of the following terms relating to the CSMA/CD MAC:

    A. Multiple access
    B. Carrier sense
    C. Collision detection
    D. Backoff

Q2. Explain Shannon's Theorem on channel capacity. Your discussion should include the following parameters: channel capacity C, bandwidth B, average signal power S, and average noise power N.

Q3. Discuss the Clos Criterion that guarantees a non-blocking switch.

Q4. Using Dijkstra's algorithm, find the least cost path from source node "u" to all other destinations. For each destination, list the nodes encountered in the traversal

Q5. When an IP datagram is dropped by a router, and the router generates an ICMP error, why does the ICMP error contain in the payload the first few bytes of the dropped IP datagram?

Q6. Compute the 16-bit Internet checksum used in most Internet protocols for the data

   "0010 1100 0111 1001 0001 0000 1000 0010 1001 1100 1111 0000"

Q7. TCP uses three-way handshaking to establish its connection. Explain three-way handshaking with related fields in TCP header.

Q8. Answer the following questions on RTS/CTS in wireless LAN.

   A. Why do we need it? (i.e., In what situation does it help?)
   B. What the costs associated with it?
   C. When do we turn if off? (considering the costs discussed in (B))
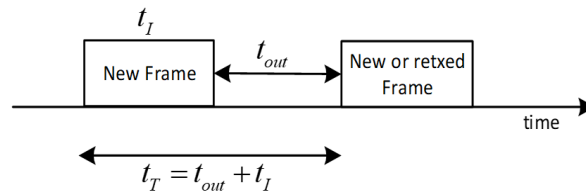   D. What is the side-effect? (i.e., Explain the Exposed Node Problem)

Q9. Answer the following questions on IP multicast.

   A. Explain the difference between Any Source Multicast (ASM) model and Source Specific Multicast (SSM) model.
   B. Which is a better model for IPTV? Explain why.

Q10. Explain the differences between 'packet switching' and 'circuit switching'.

Q11. Explain the reasons that DNS (Domain Name System) is designed as a distributed database in hierarchy of many name servers.

Q12. Compare the performance of Stop-and-Wait, Go-Back-N, and Selective Repeat, with independent packet loss of probability p and relative transmission delay $\alpha = t_T/t_I$, where t_I and t_T are defined as

$$t_T = t_{out} + t_I$$

Q13. What does the TCP congestion control aim for?

Q14. In IP addressing, explain the advantages of Longest Prefix Matching.

Q15. Explain the unique features of BGP (Border Gateway Protocol) with respect to most Intra-AS routing algorithms (e.g., OSPF).

Q16. Consider M/M/1 queue with arrival rate 3 packets/second, and service rate 4 packets/second.

    A. How many packets are in the system on average?
    B. How long will a typical packet stay in the system?
    C. If we want to halve the staying time, how much service rate should we have?

Q17. For M/M/1/k queueing system, derive the probability that an arrival packet sees the full buffer.

Q18. HTTP does not store the connection state, and the server considers any request as a new request. However, we often see the Internet advertisement targeted to the specific customer based on his/her visit history. How does it become possible under HTTP that does not store the connection state?

Q19. Suppose that you are trying to send a 10-byte information to a remote device (or server). You may use TCP or UDP. What will be the advantages of using UDP?

Q20. Explain the differences between CSMA/CD (Collision Detection) and CSMA/CA (Collision Avoidance).