weightage: 50%

CS 348: Computer Networks
Spring 2022-23, IIT Dharwad

End-semester Exam
April 16, 2023
10 AM to 1 PM

Total Marks: 54

Q1. [1 mark] Which of the following is/are NOT part of the DNS nameserver hierarchy?
a. Authoritative DNS Server
b. Top-level domain DNS Server
c. Root DNS Server
d. Leaf DNS Server
e. None of the above

Q2. [1 mark] The network layer offers guarantees on:
a. Bandwidth
b. Packet Loss
c. In-order delivery
d. Latency
e. None of the above

Q3. [1 mark] Which of the following statements is/are INCORRECT about the OSPF (Open Shortest Path First) routing protocol used in the Internet?
a. OSPF implements Bellman-Ford algorithm to find shortest paths.
b. OSPF uses Dijkstra's shortest path algorithm to implement least-cost path routing.
c. OSPF is used as an inter-domain routing protocol.
d. OSPF is based on link-state advertisements

Q4. [1 mark] DHCP server can return
a. IP address for the client device
b. Address of the first-hop router for client device
c. IP address of the DNS server
d. Network mask of the client device's parent subnet

Q5. [1 mark] In BGP's route selection algorithm, the priority order of different aspects is as follows:
a. AS-PATH length > Hot potato routing > AS policies
b. AS-PATH length > AS policies > Hot potato routing
c. AS policies > AS-PATH length > Hot potato routing
d. AS policies > Hot potato routing > AS-PATH length
e. Hot potato routing > AS policies > AS-PATH length
f. Hot potato routing > AS-PATH length > AS policies

Q6. [1 mark] Can a two-dimensional parity scheme detect all 3-bit errors?

Q7. [1 mark] Match the following. State your answer as 1-a, 2-b, ...

1. ICMP packet c	Is the payload of a/an	a. Application-layer message
2. ARP packet c		b. Transport-layer segment
3. DHCP packet b		c. Network-layer datagram
		d. Link-layer frame

Q8. [2 marks] Is there any redundancy between the checksum computed at the network and transport layers? Explain.

Q9. [2 marks] Explain the role of ICMP messages as part of the traceroute command execution.

Q10. [2 marks] What is the NEXT-HOP attribute in BGP?

Q11. [2 marks] In CSMA/CD, after the fifth collision, what is the probability that a node chooses K = 4? The result K = 4 corresponds to a delay of how many seconds on a 10 Mbps Ethernet?

Q12. [2 marks] If all the links in the Internet were to provide reliable delivery service, would the TCP reliable delivery service be redundant? Why or why not?

Q13. [2 marks] The forwarding table of a router is shown below.

Subnet Number	Subnet Mask	Interface ID
200.150.0.0	255.255.0.0	1
200.150.64.0	255.255.224.0	2
200.150.68.0	255.255.255.255	3
200.150.68.64	255.255.255.224	4
Default		0

A packet addressed to destination 200.150.68.118 will be forwarded to the interface with ID _____.

Q14. [2 marks] State the improvements in IPv6 over IPv4.

Q15. [2 marks] Considering the frame format, what's missing in IPv6 compared to IPv4, and why?

Q16. Distinguish between:

- [1 mark] Unicast vs. Multicast vs. Anycast vs. Broadcast
- [2 marks] Forwarding vs. Routing
- [4 marks] IP Address vs. MAC Address
- [4 marks] Hub vs. Switch vs. Router
- [4 marks] Link-state routing algorithms vs. Distance-vector routing algorithms

Q17. *[4 marks] Derive the efficiency of slotted ALOHA. Consider N nodes, and each node transmits in a slot with probability p.*

Hint: $(1 - 1/N)^N$ approaches 1/e as N approaches infinity.

Q18. *[6 marks] Describe the evolution of switching fabric. Highlight the improvements in each generation with respect to its predecessor. Illustrate using supporting figures.*

Q19. *[6 marks] Elaborate on the motivation and advantages of NAT. Illustrate its working principles with the help of an example.*