

1. Fill in the blanks or select the correct phrase (Total 80).

(i) (10) IEEE 802.3 Ethernet uses _____ encoding, whereas IEEE 802.5 Token Ring uses _____ encoding at physical layer.

(ii) (10) In IEEE 802.3 Ethernet, a random number of slots between _____ and _____ is skipped after n collisions.

(iii) (10) In datagram subnets, each packet contains the full source and destination address, whereas in virtual circuit subnets each packet contains a _____.

(iv) (10) If subnet numbers are used in IP, number of bits in the subnet address could be determined by _____ the IP address with the _____ since the IP address class is already known.

(v) (10) The set of optimal routes from all sources to a given destination form the _____.

(vi) (10) The best example of the distance vector routing algorithm in TCP/IP is _____.

(vii) (10) The best example of the link state routing algorithm in TCP/IP is _____.

(viii) (10) Packet life in IP is controlled by the _____ field in IP header.

2. (Total 60) Assume you are the network engineer for the Ethernet LAN shown below. Note that distances between the departmental LAN's are significant and PC's at each department rarely communicate with each other.

(i) What could be the problem if PC's at each department mostly access the server in that department and sometimes access servers in other departments (15) ? To remedy the problem, suggest a minimum cost modification to the Ethernet LAN and justify your suggestion (15).

(ii) Suggest a minimum cost modification if PC's at Department A frequently access also the server at Department C and vice versa (15).

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(iii) Suggest a minimum cost modification if there are several servers at Department B (instead of one) and all PC's at all departments access these servers frequently (15). (Answer at the back)

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3. (50) Assume distance vector (distributed) routing is used and the **delay** (in msec) is the metric. Node N10 receives the delay vectors shown below from its neighbor nodes N1, N8, N9 and N11. Assume node N10 has just estimated its delay to its neighbors N1, N8, N9 and N11 as 8, 12, 10 and 6 msec, respectively. Complete the empty vectors of the table below, by computing the new estimated delay (and the output line) from node N10 to every other node N1-N12.

To:	From N1	From N8	From N9	From N11	? New estimated Delay from N10	? Output Line
N1	0	20	24	21		
N2	12	31	36	28		
N3	25	19	18	36		
N4	40	8	27	24		
N5	14	30	7	22		
N6	23	19	20	40		
N7	18	6	31	31		
N8	17	0	20	19		
N9	21	14	0	22		
N10	9	7	11	10		
N11	24	22	22	0		
N12	29	9	33	9		

4. (40) Briefly explain how the routing is achieved in Internet Protocol (IP).
5. (40) In link state routing, flooding is used to distribute the link state packets. Explain how the distribution, i.e. the flood, is controlled to prevent excessive number of packets in the net.
6. (40) Explain the idea of hierarchical routing and how it is related to CIDR (Classless Inter Domain Routing) in TCP/IP.
7. (40) In IP over Ethernet, explain how a source host determines the MAC address of a destination host to send an IP packet to that destination. What is the name of the related protocol?

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8. (50) Explain what the IP fragmentation is and why we do not like fragmentation in IP over Ethernet. (Answers for the last three questions are at the back)