

Indian Institute of Engineering Science and Technology, Shibpur
B.Tech 6th Semester (CST) Examination 2018
Under 5-year Dual-Degree (B. Tech-M. Tech) Programme

Computer Network and Distributed Systems

CS-602

Full marks: 70

Time: 3 hours

*Attempt mandatory question 1 and any 4 from the rest
All parts of the same question must be answered together*

1. Answer all questions (a to f). Total marks 30.

(a) Find the Class of following IPv4 addresses with explanation

(i) 180.5.50.121, (ii) 215.33.10.10, (iii) 01001001 00101001 00001011 11101111
[2]

(b) Each of the following IPv4 addresses belong to a block. Find the first and last address of each block – (i) 23.221.71.18/26 and (ii) 10.45.72.8/28
[2]

(c) A router in an IP network has the following routing table:

Subnet Number	Subnet Mask	Interface
233.197.152.0	255.255.248.0	Eth0
233.197.128.0	255.255.252.0	R1
233.86.0.0	255.255.192.0	R2
233.197.130.0	255.255.254.0	R3
Default		R4

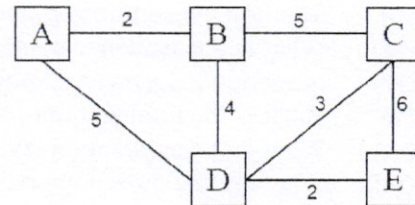
Find the next hop for packets having the following destination IP addresses:

(i) 233.86.16.234, (ii) 233.197.131.25, (iii) 233.86.130.186, (iv) 233.197.155.138
[8]

(d) A five node autonomous system (AS) is shown using the following graph, where routers are represented by the nodes of the graph. The cost of individual link between the routers is mentioned in the graph itself. The Link State Routing protocol is used as the intra-AS routing protocol and each router shares LSP packet periodically. Answer the following questions:

(i) Mention initial Link State knowledge of every router on neighbor discovery procedure. Also mentioned final routing table of each router after convergence.

(ii) Illustrate the step-by-step process of calculating shortest path tree (using *Dijkstra* algorithm) only from node C to rest of the nodes.



[4+4]

(e) A host S needs to send a message consisting of 9 packets to host R using a sliding window and Selective-Repeat/Reject ARQ error control strategy, with window size set to 4. Note that all packets are ready and immediately available for transmission.

(i) Illustrate the data packets transmitted by S and the acknowledgements transmitted by R for sending the entire message, assuming no data packet or acknowledgement gets lost.

(ii) Now consider that every 5th packet that S transmits gets lost, but no acknowledgements from R ever get lost. Illustrate the process in this modified scenario.

[3+3]

(f) The bits 10101101 are to be transmitted using the CRC polynomial $(x^3 + 1)$. What is the final bit pattern that will be transmitted?

[4]

2. An ISP is granted the block 180.20.56.128/26 IPv4 address. As of now, the requirement of the ISP is to allocate IP address among three organizations, Org-1, Org-2 and Org-3 with 12, 6 and 7 IP addresses respectively.

(a) Keeping conservation of IP addresses in mind, how effective way the block can be utilized?

(b) For every organization, find the following:

(i) Network Id, (ii) Netmask, (iii) Range of IP addresses, (iv) Directed broadcast IP address

[2+8]

3. (a) What is NAT? Explain the NATing technique using a suitable example.

(b) A router received an IPv4 datagram containing 4500 bytes of payload. It is also observed that DF flag in IPv4 header is set to zero (0). The datagram has to be forwarded to next-hop over an Ethernet LAN. Ethernet frames may carry data up to 1500 bytes (i.e. MTU=1500 bytes) and note that the size of IP header is 20 bytes (*there is no option field in the IP header*).

(i) How many total number of IP fragments will be transmitted?

(ii) Mention the value of MF and Fragment-Offset of IPv4 header of each fragment. Answer with justification.

[4+6]

4. Following is the part or complete TCP header dump (contents) in hexadecimal format.

CAF30050 00004E20 00004650 503070FF 00000190

Answer following questions with brief justification:

(i) Is this complete TCP header dump?

(ii) Mention the source port and destination port number.

(iii) What is the sequence number?

(iv) Is acknowledgement number valid? If yes, then what is the acknowledgement number?

(v) What is the total amount of yet to be acknowledged bytes?

(vi) What is the application layer protocol?

(vii) What are the other important observations do you have?

[10]

5. (a) Explain how slotted ALOHA protocol achieves better throughput than pure ALOHA. Discuss impact of vulnerable time in this context.

(b) In CSMA/CD network, why there is a restriction on the minimum and maximum frame size? What is the minimum frame size in case of 10Mbps Ethernet LAN (802.3)?

[5+5]

6. (a) What is two-node instability (or two-node loop) problem in the context of Distance Vector Routing (DVR) protocol?

(b) The routers R1 and R2 are direct neighbor to each other. The routers periodically exchange Routing Information Protocol (RIP) message with the neighbor routers and the receiving routers update their routing table as per the protocol. The existing routing table of R1 for an instance is as mentioned below.

What will be the updated routing table of R1 on reception of this particular RIP message from R2 as stated below? The answer should have brief justification for the action taken for each subnet.

<i>Existing routing table of router R1</i>		
Subnet	Cost	Next Hop
Net1	3	R3
Net2	7	R2
Net4	4	R2
Net5	5	R4
Net6	4	R6
Net7	2	R5

<i>RIP message received from R2</i>	
Subnet	Cost
Net1	1
Net3	4
Net4	5
Net5	4
Net6	5

[3+7]

7. Write short note on any 2 from the following:

(a) Direct Sequencing Spread Spectrum (DSSS)

(b) Address Resolution Protocol (ARP)

(c) Domain Name Service (DNS)

[2x5]