

B.Sc. (Honours) Examination, 2019

Semester-VI

Computer Science

Course : BCSC-61

(Computer Networks)

Time : 3 Hours

Full Marks : 40

Questions are of value as indicated in the margin

Attempt Question No.1 and **any three** from the rest.

1. a) If number of hosts in a slotted ALOHA network = N , probability of generating a packet for transmission during a slot = P_A , what is the probability of successful transmission of a packet in next slot? Assume no host is already under collision.
b) If speed of signal in the medium of a slotted ALOHA bus network is 10^8 m/sec, length of the bus = 80m, what should be the maximum link capacity for supporting L2 packet size = 1500 bytes?
c) If speed of signal in the medium of CSMA-CD bus network is 10^8 m/sec, length of the bus=80 m, what is the minimum length of CD-preamble if link capacity = 10 Mbps?
d) What is the maximum number of hosts if the local net id is 192.168.0.0?
e) Find the maximum number of subnets with subnet mask 255.255.224.0 within a class-B network. 2×5=10
2. If a host suffers a collision with another host in a CSMA-CD network with packet transmission time – T_{tx} and collision resolution interval unit = T_c ,
a) Find the average recovery time for each of the colliding hosts for p-persistent retrials. Assume there is no intervention from any third host during recovery.
b) Find the average recovery time for BE backoff. Assume there is no intervention from any third host during recovery. 5+5=10
3. a) Illustrate how the route of an outgoing IP packet can be found by the sender using the TTL field of IP header.
b) Host A is sending IP packets to host B across four networks N_A , N_1 , N_2 and N_B . Link layer packet payload sizes for the networks are 1500, 800, 600 and 1500 bytes respectively. Assuming 20 bytes of TCP and 20 bytes of IP headers, illustrate the IP fragmentation and reassembly in this example. Mention the relevant IP header parameters.
c) Illustrate one scenario where IP header size can vary. 3+5+2=10
4. a) Illustrate how initial sequence numbers, receiver window size and maximum segment size values are exchanged between the client and server in the beginning of TCP session.
b) Illustrate transitions from slow-start to congestion-avoidance, and congestion-avoidance to slow-start phase of a TCP session. 4+6=10
5. a) There are six interior gateways G1 to G6 in an autonomous system running RIP. The adjacency matrix is as follows:

	G1	G2	G3	G4	G5	G6
G1	0	1	1	1	-	-
G2	1	0	1	-	1	-
G3	1	1	0	1	1	-
G4	1	-	1	0	1	1
G5	-	1	1	1	0	1
G6	-	-	-	1	1	0

(2)

Illustrate a sequence of RIP interactions by which routing tables of all gateways are updated with routes to G6 when G4-G6 link goes down.

- b) Mention four important differences between RIP and OSPF routing protocols. $6+4=10$
6. An academic institution is assigned a net id 144.16.0.0. There are four faculties for Science, Social Science, Languages and Fine-arts, each with upto 10 departments. The campus network backbone connects the border gateway and one gateway each for each faculty net. Each faculty net connects the faculty gateway and one gateway each to each individual department LANs.
- a) Make a subnet id, subnet mask and host id allocation plan for the campus backbone, faculty nets and departmental LANs.
- b) Show the IP addresses for the gateways in the institution.
- c) Show the routing table entry in border and faculty net gateways for any two department LANs belonging to different faculties. $5+2+3=10$
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