

NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Department of Computer Science and Engineering

July-Dec Semester 2021

Subject: Computer Networks (CS5403)

Full Marks: 40

Duration: 2 Hours

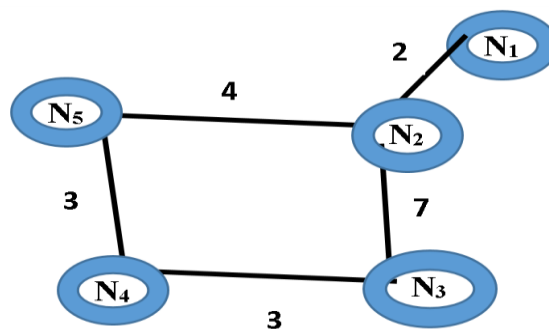
**All questions are compulsory. Make assumption of missing data if any.
Please write precise and to the point answers, irrelevant and lengthy answers may attract penalty.**

1. (a) Computer A has 19.5MB to send on a network and transmits the data in a burst @ 6 Mbps. The maximum transmission rate across routers in the network is 4 Mbps. If Computer A's transmission is shaped using a leaky bucket, how much capacity must the queue in the bucket hold not to discard any data [3]
- (b) (i) A sender uses Stop and wait ARQ protocol for reliable transmission of frames. The size of frame is 2000 bytes and the transmission rate at sender side is 20 kbps. Size of acknowledgement is 200 bytes and transmission rate at receiver is 6 kbps. The one-way propagation delay is 100 ms. Assuming no frame is lost, what is the sender throughput in bytes per second.
- (ii) What should be the frame size using stop and wait protocol for an utilization of 80% bandwidth and propagation delay being 2 kbps and 50 ms. [4]
- (c) The maximum size of sliding window at sender side in Go Back N ARQ is $2^n - 1$ for $n \geq 2$ where n is number of bits in sequence number. Analyse it. [3]
2. (a) Subnet the Class C IP Address 195.1.1.0 So that you have 10 subnets each with a maximum 12 hosts on each subnet. List the Address on host 1 on subnet 0, 1, 2, 3, 10. [3]
- (b) Consider the following IP address requirement of NIT Patna and answer the questions following: [5]
 - Each of major departments i.e. CSE, ECE, ME, EE and CIVIL is assumed to have 200 students in each year, making total number of students in each of these departments to 820.
 - Each of minor departments i.e. HSS, MATH, PHY, CHEM is assumed to have 30 students in each year, making total number of students in each of these departments to 120.
 - Total Number of Teaching Staffs count to 200.
 - Total number of Non-Teaching Staffs count to 600.
 - NIT Patna wish to reserve 100 IPs for Guest users.
- I. Which private IP address range you think will be sufficient to fulfill the need of all users of NIT Patna, justify with reason?

- II. It is required to make each of above nine departments, Teaching, Non-Teaching and Guests user a different Network / Sub-Network (making total number of Networks to twelve). Do the IP allocation for each of these Network / Sub-Network along with mentioning (using the IP address range you selected in part I)
 - a. Network Address and Broadcast Address of each Network / Sub network
 - b. Subnet mask address of users of that each Network / Subnetwork
- III. Calculate and explain the wastage of IP if any.

(c) What are the difference between Leaky Bucket and Token Bucket algorithm? [2]

3. (a) Consider a network with 5 no of nodes N1 to N5. The network uses distance vector routing protocol. Write all distance vector of different routes. The distance vector is distance path instance to node N1 to N5. In each round all nodes exchange their respective neighbor and update their distance vector in between 2 rounds. Any change in cost of link will cause the two incident node to change only that entry. The cost of link N2 to N3 reduces to 1 after next round what will be the new distance vector at node N3. [4]



- (b) Suppose a TCP connection is transferring a file of 12,000 bytes. The first byte is numbered 10001. What are the sequence numbers for each segment if data are sent in six segments, each carrying 2,000 bytes?
 Draw the state diagram using different FLAG variables and sequence no of packets to show the connection establishment, data transfer and connection termination process of TCP connection for the aforesaid example. [3]
- (c) Compare distance vector routing and link state routing protocol. Analyze disadvantage of Distance Vector Routing protocol. [3]
4. (a) Data which is sent from sender to receiver is 1101 and divisor is $X^6 + X^3 + 1$. What is the value of CRC? [3]
- (b) Encode a binary word 11001 into the even parity hamming code. [4]
- (c) Describe the state diagram of TCP Protocol. [3]