

Nirma University

Institute of Technology

Semester End Examination (IR/RPR), December 2020
B. Tech. in Computer Science and Engineering, Semester V

2CS502 / CE503 Computer Networks IT501 Data Communication Networks

Time: 1.5 Hours

Max. Marks: 40

Instructions:

1. Attempt all questions.
2. Figures to the right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Assume suitable data wherever necessary and specify them.
5. **Sub-questions of each of the three questions must be written together.**

Q.1 Do as Directed. [14]

- A)** Compare the delay in sending an x -bit message over a k -hop path in a circuit-switched network and in a (lightly loaded) packet-switched network. The circuit setup time is s sec, the propagation delay is d sec per hop, the packet size is p bits, and the data rate is b bps. Under what conditions does the packet-switched network have a lower delay as compared to circuit-switched network? Also, explain the conditions under which a packet-switched network is preferable to a circuit switched network. **(6)**
- B)** Write a pseudocode for bidirectional stop-and-wait data link layer protocol for reliable channel. **(4)**
- CO1
BL4
CO2
BL6

OR

- B)** Analyze the best case, worst case and average case channel efficiency of Bitmap protocol for channel access. **(4)**
- C)** Why do data link layer protocols need framing? What are the consequences of not having framing as part of DL protocol? **(4)**
- CO2
BL4
CO1
BL5

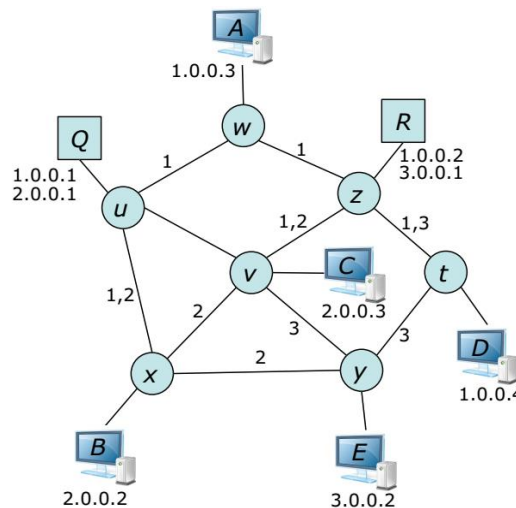
Q.2 Do as Directed. [14]

- A)** Suppose that host A is connected to a router R1, R1 is connected to another router, R2, and R2 is connected to host B. Suppose that a TCP message that contains 1200 bytes of data and 20 bytes of TCP header is passed to the IP code at host A for delivery to B. Show the Total length, Identification, DF, MF, and Fragment offset fields of the IP header in each packet transmitted over the three links. Assume that link A-R1 can support a maximum frame size of 1024 bytes including a 24-byte frame header, link R1-R2 can support a maximum frame size of 512 bytes, including a 12-byte frame header, and link R2-B can support a maximum frame size of 256 bytes including an 8-byte frame header. **(7)**
- B)** A company is assigned the network address 172.11.128.0/17. The **(7)**
- CO2
BL3

CO3 network is to be divided into four subnets having 2048, 4096 and
BL3 1024 and 8192 host computers. Please note that subnets are to be created in this order only. Calculate network address, subnet mask and range of IP addresses for each subnet. How many IP addresses will remain unallocated?

OR

B) The diagram at right shows a switched Ethernet LAN with two routers (labeled Q and R), seven switches and five hosts. The switches are configured with three VLANs and the labels on the links show the VLANs that are active on those links (note, some links are active in multiple VLANs). Each VLAN is assigned an IP subnet, specifically, VLAN 1 is assigned subnet 1.0.0.0/8, VLAN 2 is assigned subnet 2.0.0.0/8 and VLAN 3 is assigned subnet 3.0.0.0/8. The two routers each belong to two subnets and can send/receive packets using two VLAN ids, while each of the hosts is configured in the VLAN that corresponds to its IP subnet. (7)



- If host B sends a packet to host E, what switches and routers does the packet pass through? List them in order, repeating any switches that the packet passes through more than once.
- If C is transferring a large file to E while B is transferring a large file to D, what data rate would C and B get, assuming that the switch links are all 100 Mbps?

Q.3 Do as Directed. [12]

A) A computer can produce data at the rate of 400 Mbps and the network runs at 40 Mbps. Suppose data comes in 2 MB bursts, one 40-millisec burst every second. The average outgoing data rate required is 2 MB/sec. The capacity of the token bucket and leaky bucket is 1000 KB. Output of the token bucket is fed into the leaky bucket. Calculate time taken to transmit one burst. (7)

B) Write pseudocode of a client application to send an email to an email server by implementing SMTP protocol using Berkeley Sockets API. (5)