VIT Vellore Institute of Technology Reg. No. : [redacted]

Final Assessment Test (FAT) - APRIL/MAY 2023

Programme	B.Tech	Semester	Winter Semester 2022-23
Course Title	COMPUTER NETWORKS	Course Code	BCSE308L
Faculty Name	Prof. Kanchana Devi V	Slot	F2+TF2
		Class Nbr	CH2022235000747
Time	3 Hours	Max. Marks	100

Section-1 (10 X 10 Marks)

Answer All questions

Q1. Mr. Titan is chatting with his friend Mr. Rado over the Internet. Use your networking skill and specify how the messages from Titan reach Rado. Discuss the entire process undergoes through different layers before it reaches Rado over Internet with neat sketch. [10]

Q2. Consider two hosts A and B are connected by a single link of rate 'R' bps. Suppose that the two hosts are separated by 'm' meters, and the propagation speed along the link is 'S' meters/sec. Host A is to send a packet of size L bits to Host B. [10]

(i) Ignoring processing and queuing delay, obtain an expression for the end-to-end delay. (2 marks)

(ii) Suppose S=2.5*10^8 meters/sec, L=120 bits, and R=56kbps. Find the distance 'm' so that the propagation delay equals transmission delay (4 marks)

(iii) In the end-to-end delay, Which of the above mentioned delays are constant and which are variable? Justify. (4 marks)

Q3. Compare and contrast the features of datagram based packet switching and virtual circuit based packet switching in terms of the following factors. [10]

a. Connection setup
b. Routing
c. Effect of Route failure
d. QOS
e. Congestion control

Q4. Consider a scenario while using Goback-N ARQ with S_f =50, S_n =52 and Window size=7. [S_f represents the sequence number of First outstanding frame and S_n represents the sequence number of next frames to be sent out]. Find out the new value of S_f and S_n when each of the following scenarios happens and explain them individually with neat diagram. [10]

- Top (network) layer sends 2 packets more.
- Timeout happens when Sf =50, Sn =52 and Window size=7.
- Sender receives Acknowledgement with number 50 from the receiver.

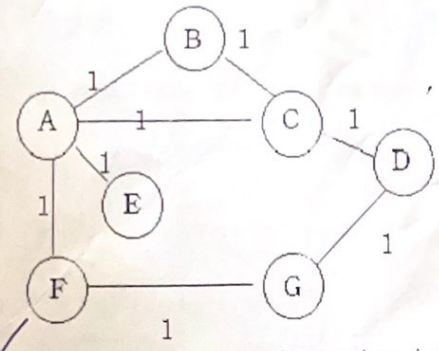
Q5. You are a member of a team tasked with designing a wireless network for a smart city project. The wireless network must provide seamless connectivity for a range of devices, including smart traffic lights, environmental sensors, public safety cameras, and mobile devices. The network must also support emerging technologies such as 5G, IoT, and AI, while ensuring security, reliability, and interoperability across different networks and devices. How can the team leverage IEEE wireless protocols to design a wireless network infrastructure that enables seamless [10]

connectivity and interoperability between a wide range of devices and networks, while also addressing the challenges posed by emerging technologies such as 5G, IoT, and AI in a smart city environment?

06. Assume that you are assigned the role of Network Administrator in XYZ Company. You need to assign a block of addresses starting with 152.20.24.0/24 to 5 departments namely Operations with 120 users, Finance with 50 users, Technical Support 28 users, Quality Assurance 12 users, Sales with 8 users. Consider two routers R1 and R2 with four interfaces. R1 is connected with the departments Operations, Finance and Technical Support. R2 is connected with Quality Assurance and Sales department. R1 and R2 are connected directly. Design the network and show the forwarding table of R1, R2 with network addresses and interface identifiers. [10]

07. Assume that an IP datagram of size 2000 bytes (payload+header) arrives at router R1. R1 has to forward this IP datagram to a host X in a network with Maximum Transfer Unit (MTU) as 500 bytes. Illustrate the process of fragmentation with number of fragments created during packet transmission, HLEN, Total length, Do not Fragment, More Fragment, Fragmentation offset fields for both original datagram and fragment. [10]

08. Consider the following network and construct routing table from E to all other nodes using Distance vector routing. Show the intermediate steps in detail with diagrams. [10]



09. a. TCP sender has the value of congestion window to be 5000 and the receive window as 7000. The host transmitted 4000 bytes over the network which has not yet been acknowledged. How many more bytes can be sent? Explain in detail. [5 marks] [10]

b. Assume that node A establishes TCP connection with node B with initial sequence number as 1000 and B responds with initial sequence number of 1400. Show the three TCP segments during the connection establishment with appropriate illustrations. [5 marks]

10. Suppose that A wants to send an email message to B. This will involve four entities: A's mail client (for email composition and sending), A's outgoing mail server, B's incoming mail server, and B's mail client (for email retrieval and viewing). Explain the communication that happens between these four entities with a suitable diagram and also discuss the usage of various protocols for this scenario. [10]