14/12/24 CFN

Roll No. | | | | | | | | | | |

B.E (FT) END SEMESTER EXAMINATIONS – Nov / Dec 2024

Computer Science and Engineering

Semester - V

CS6111: Computer Networks

(Regulation 2018- RUSA)

Time: 3 Hours Answer ALL Questions Max. Marks 100

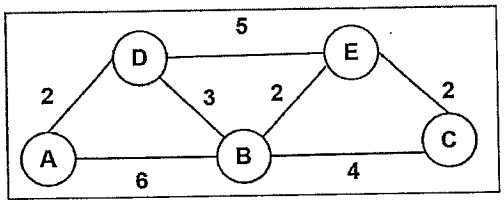
CO1	Highlight the significance of the functions of each layer in the network
CO2	Identify the devices and protocols to design a network and implement it
CO3	Build network applications using the right set of protocols and estimate their performance
CO4	Trace packet flows and interpret packet formats
CO5	Apply addressing principles such as subnetting and VLSM for efficient routing
CO6	Explain media access and communication techniques

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

Sl.No.	PART- A (10 x 2 = 20 Marks)	Marks	CO	BL
1.	If there are 'n' layers in a network protocol stack, and each layer adds a header of 'h' bytes, how many bytes are transmitted into the network?	2	1	2
2.	What is the role of the local name server and the authoritative name server in DNS?	2	2	1
3.	Why does UDP exist? Would it not have been enough to just let user processes send raw IP packets?	2	2	2
4.	Suppose TCP operates over 125MB/Sec link. Assume TCP could utilize the full BW continuously, how long would it take the sequence number to wrap around completely?	2	3	4
5.	Is 196.16.144.99 / 23 - a host or a network or a broadcast address?	2	5	3
6.	What will be the CIDR mask that you need to use to support 14 networks of 1000 nodes each?	2	5	3
7.	How do traditional computer networks differ from software-defined networks (SDNs) in terms of control mechanisms?	2	2	2
8.	Assuming a framing protocol that uses bit stuffing: show the bit sequence transmitted over a link, when the frame contains the following bit sequence 1111011111010011111101011111110. Mark the stuffed bits.	2	6	4
9.	How does NAT enable multiple devices to share a single public IP address?	2	5	2
10.	What are the three guided media commonly used for data transmission?	2	6	1

	PART- B (8 x 8 = 64 Marks) (Answer any 8 questions)	Marks	CO	BL
11.	What are the roles of the network edge and core in data communication, and how does their interaction impact performance in scenarios like real-time streaming or IoT?	8	2	2
12.	Trace the events that take place from the time you login to your account at gmail.com and send a mail to xyz@annauniv.edu. User xyz retrieves his/her mail. Give full details of all the protocol steps involved at all levels of the network stack in this process.	8	3	3
13.	Trace the TCP finite state machine transitions for two sites that execute a passive and an active open and step through the three-way handshake.	8	1	2
14.	Assume that one side transfers 256KB of data in packets of 16KB to the other side. If the network is congested and every fifth packet is lost, show the sequence of packets that will be transmitted. How long will it take for the transfer to complete? Use TCP slow start algorithm.	8	3	4
15.	Consider sending a 3000-byte datagram with sequence number 199 that has arrived at a router R1. It needs to be sent over a link that has an MTU size of 850 bytes to R2 and then over a link with an MTU of 400 bytes to reach the destination. Show how IP would fragment these packets at each router.	8	1	3
16.	Device a subnet addressing scheme for our university if we are assigned only 1 IP address – 144.20. The following LANs are to be accommodated : Admin Network – 1 LANs of 500 systems Faculty Network – 1 LANs of 1000 systems Library Network – 1 LAN of 400 systems Others – 2 LAN of 250 systems each. Show the entries to be used at the routers	8	5	3

17.	Explain link-state routing protocol using the following sample network (for D node).  	8	5	3
18.	Suppose we want to transmit a message 10110001111011 and protect it from errors using the CRC polynomial $x^8 + x^2 + x + 1$. Determine the CRC bits to be added. If an error occurs in the left most bit, show that this CRC will help detect the error.	8	6	4
19.	Explain the media access technique used in Ethernet. Why is this technique not suitable for wireless networks?	8	6	2
20.	Consider a stream of binary data consisting of the sequence 10100000000001100001, Draw the waveform for this sequence using Bipolar – AMI, B8ZS and HDB3.	8	6	3
21.	What is the necessity for the ARP protocol with IPv4? How is it avoided in IPv6?	8	2	2
22.	Consider an institutional LAN of 1Gbps with 100 machines connected to the internet by means of proxy server, where a web is located. List the sequence of steps carried out for any request originating from any machine. Suppose that each machine generates requests at the rate of 100 objects/sec. Let the average size of the object be 10kbytes. Assume an average RTT of 10ms from web cache to any arbitrary server. If the cache has a hit rate of 50%, what should be the average response time seen by any machine?	8	3	4

	PART- C (2 x 8 = 16 Marks)	Marks	CO	BL
23.	A company has deployed a web application hosted in a data center, which is accessed by users worldwide. The users report the following issues: • Users in regions with **low latency** (e.g., within the same continent as the data centre) experience smooth and fast access. • Users in regions with **high latency** (e.g., across continents with undersea cable links) face delays and occasional timeouts while loading pages. • During periods of **high traffic**, users in high-latency regions report significant delays, and some connections drop without retrying in a timely manner. • Logs reveal that retransmissions are occurring frequently, but the retransmitted segments are often being sent too early or too late, failing to efficiently adjust to varying network conditions. i. Identify the underlying issue with TCP's behavior in this scenario. ii. What mechanism can be applied to address this issue? iii. Describe how the mechanism works and why it solves the problem.	8	2	5
24.	A multinational corporation operates a large-scale, distributed network infrastructure spanning multiple regions across the globe. The network architecture is as follows: • The corporation owns **three autonomous systems (AS)**: **AS1**: North America Operations **AS2**: Europe Operations **AS3**: Asia Operations • Each AS has its own set of internal routers connected via **OSPF** (Open Shortest Path First). • There are dedicated links between AS1-AS2, AS1-AS3, and AS2-AS3 for intercontinental communication. • The corporation plans to interconnect these ASs to: ▪ Share routing information. ▪ Ensure redundancy and fault tolerance in case one link between the ASs fails. ▪ Maintain control over route advertisements for cost optimization and security. i. Identify why an interior gateway protocol (IGP) like OSPF is unsuitable for this architecture. ii. Which routing protocol is most appropriate for enabling communication between the ASs? iii. Explain the steps involved in setting up the chosen protocol, including: Configuring routers within each AS and Setting up inter-AS communication.	8	3	6