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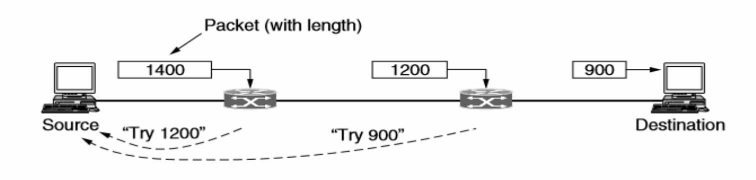
Academic year 2023-2024 (Even Sem)

DEPARTMENT OF **COMPUTER SCIENCE AND ENGINEERING**			
Date	August 2024	**Maximum Marks**	10 + 50
Course Code	CY245AT	**Duration**	120 Minutes
Sem	IV		
COURSE NAME **IMPROVEMENT CIE SCHEME**			

Sl. No.	PART-A	M	BT	CO
1	**62.54.165.38** in IPv6 format is: `::ffff:3e36:a526` **229.154.76.90** in IPv6 format is: `::ffff:e59a:4c5a`	2	L3	2
2	For `20.10.30.35 /27`: • **Usable IP Range**: `20.10.30.33` to `20.10.30.62` For `100.1.2.35 /20`: • **Usable IP Range**: `100.1.0.1` to `100.1.15.254`	2	L3	3
3	ARP, RARP	2	L4	3
4	**Broadcast address** for the network: **160.36.31.255** **Network ID** for the network: **160.36.30.0**	2	L4	4
5	Identify type of QoS scheme used in following scenarios: i. Differentiated Service ii. Integrated Service	2	L4	5

Sl. No.		PART-B	M	BT	CO
1	(a)	i. Classify following scenarios under congestion and flow control: a. Congestion Control b. Congestion Control c. Flow Control d. Congestion Control e. Flow Control f. Congestion Control ii. Suppose you have a congested network. • It is always not possible to provide QoS on a congested network. Because QoS needs some resource allocation in advance. When network is congested, its difficult to do that. • Yes. There is a way to provide QoS on a congested network. It can be best effort mechanism but cannot be guaranteed. Opting for Differentiated services, its possible to classify packets based on priority and give QoS.	10	L4	CO3
2	(a)	Given: The router can process 1515 million packets per second. The load offered to the router is 1212 million packets per second.	10	L4	CO3

		This is a classic queueing theory problem. Assuming the router behaves like an M/M/1 queue (a common assumption for packet routers), the average waiting time can be calculated using Little's Law and the formula for the average waiting time in an M/M/1 queue: $Wq=\lambda\mu(\mu-\lambda)$ Where: $\lambda\lambda$ = arrival rate (12 million packets/sec) $\mu\mu$ = service rate (15 million packets/sec) Substituting the values: $Wq=12\times10^6/15\times10^6\times(15\times10^6-12\times10^6)$ $Wq=12/15\times3=12/45=$**0.267 seconds** Thus, the average waiting time for each packet at the router is approximately 0.267 milliseconds (or 267 microseconds). The waiting time at each router is approximately 0.2670.267 milliseconds. There are 7 routers on the route from the source to the destination. The total time spent being queued and serviced across all routers is the waiting time per router multiplied by the number of routers: Total Time=7×0.267 milliseconds=**1.869 milliseconds**			
3	(a)	**Number of bits for hosts**: 10 bits. **Number of bits for subnets**: 6 bits. **Subnet mask**: **255.255.252.0** (/22). **First five subnet IDs and host ranges**: • Subnet 1: **182.17.0.0/22**, Hosts: **182.17.0.1 to 182.17.3.254** • Subnet 2: **182.17.4.0/22**, Hosts: **182.17.4.1 to 182.17.7.254** • Subnet 3: **182.17.8.0/22**, Hosts: **182.17.8.1 to 182.17.11.254** • Subnet 4: **182.17.12.0/22**, Hosts: **182.17.12.1 to 182.17.15.254** • Subnet 5: **182.17.16.0/22**, Hosts: **182.17.16.1 to 182.17.19.254** **Each subnet can support up to 1022 hosts** if the department grows in the future.	10	L3	CO2
4	(a)	**purpose of TTL field:** Time-to-live (**TTL**) is a value in an Internet Protocol (**IP**) **packet** that tells a network router whether the **packet** has been in the network too long and should be discarded. **operating principle:** TTL may be implemented as a counter or timestamp attached to or embedded in the data. Once the prescribed event count or timespan has elapsed (ttl=0), data is discarded. i. If there is a packet originating at Router 1, minimum TTL value to reach Routers 2,6,8 are respectively **2,3,3**. ii. Packet originating at Router 1 destined to Router 7 has TTL=2. Minimum needed value is **TTL=3** as its 3 hops away from Router 1. On the path 1->3->4->7, packet with TTL=2 will reach till Router 4. Since TTL=0 here, Router 4 discards packet and sends and **ICMP error** message to Router	10	L4	CO4

		1. Now Router 1 should set TTL to higher values and send. iii. header checksum field is needed to **verify the integrity** of the fields in the IP header. No bits should be corrupted during transmission. If any changes, calculation shows wrong and packets discarded. iv. Even if most of the fields are intact in the IPv4 header, at least TTL field will change. Because each router decrements its before forwarding. Hence each router should recompute the header checksum and then forward.			
5	**(a)**	i) How many fragments are generated? 4 (2M) ii) List the various IP header fields related to fragmentation. (1M) **IHL, Total Length, MF flag and Fragment offset** iii) What are the values in the various fields in the IP datagram(s) generated related to fragmentation? (2M) Each fragment will have Identification number 422. Each fragment except the last one will be of size 700 bytes (including IP header). The last datagram will be of size 360 bytes (including IP header). The offsets of the 4 fragments will be 0, 85, 170, 255. Each of the first 3 fragments will have flag=1; the last fragment will have flag=0. iv) Illustrate how IPv6 handles the fragmentation entirely?(5M) IPV6 and Fragmentation • Uses the process is called path MTU discovery. • Each IP packet is sent with its header bits set to indicate that no fragmentation is allowed to be performed. • If a router receives a packet that is too large, it generates an error packet, returns it to the source, and drops the packet. 	10	L4	CO5

COURSE OUTCOMES:

CO1 Apply the algorithms/techniques of routing and congestion control to solve problems related to Computer Networks.
CO2 Analyse the services provided by various layers of TCP/IP model to build effective solutions.

CO3 Design sustainable networking solutions with societal and environmental concerns by engaging in lifelonglearning for emerging technology.
CO4 Exhibit network configuration, protocol usage and performance evaluation in networks.
CO5 Demonstratethe solutions using various algorithms/protocols available to address networking issues usingmodern tools by exhibiting team work and effective communication.

COs/BTL	CO1	CO2	CO3	CO4	L1	L2	L3	L4
Marks								