

END TERM EXAMINATION

COMPUTER NETWORKS

B.Tech (IT + CS)-4th Semester

Course Instructor- Dr. Deepshikha Agarwal

Time duration: 3 hours

Max. Marks: 70

- Wherever necessary, make assumptions and solve the questions

SECTION-A (Attempt all questions)

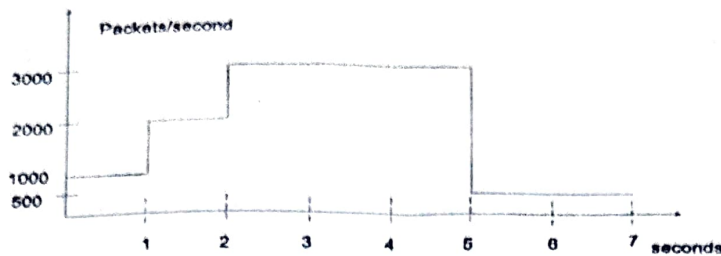
30 Marks

- Q1) Why is Flow control and error control functions carried out twice on different layers- Transport and Data Link layer? [3 marks]
- Q2) (a) Elaborate the scenario where ARP protocol can be used to breach security in a network. (b) How does ARP deal with stale entries in the mapping table? [3+3 marks]
- Q3) (a) Why is TCP said to be tightly coupled with the IP protocol? (b) Differentiate between TCP and UDP protocol [3+3 marks]
- Q4) List the various error messages which are reported by the ICMP protocol. [5 marks]
- Q5) Draw the State diagram for DHCP client and transitions among them [5 marks]
- Q6) Why does the Distance Vector protocol suffer with the Count-to-Infinity problem? Explain with suitable example. How can this problem be resolved? [5 marks]

SECTION-B (Attempt any 4 questions)

Marks- 4 x 10 = 40

- Q7) (a) Draw the command sequence diagram of the phases in POP3 Client and Server when the client has 4 messages in the mail box- mssg 1 (20 Bytes), mssg 2 (140 Bytes), mssg 3 (100 Bytes), mssg 4 (135 Bytes) (b) Draw and compare the architecture of SMTP with Relay MTAs and Without Relay MTAs. [5+5 marks]
- Q8) (a) Consider an instance of TCP's Additive Increase Multiplicative Decrease (AIMD) algorithm where the window size at the start of slow start phase is 2 MSS and the threshold at the start of first transmission is 8 MSS. Assume that a time out occurs during the fifth transmission. Find the congestion window size at the end of tenth transmission. (b) A router uses the Token Bucket Algorithm to regulate the flow where the Bucket Depth is 5000 Bytes. Arrival rate of tokens is 1000 tokens/sec. Each token has a size of 1 Byte. Initially the bucket is full. The actual arrival rate of packets in terms of time is shown in the figure below.
- Sketch the number of tokens in the bucket as a function of time
 - Sketch the cumulative number of packets sent out by the router
 - Sketch the packet rate sent out by the router as a function of time



Q9) (a) Differentiate between Transparent and Non-transparent fragmentation.

(b) How is fragmentation different from segmentation done by TCP?

© An IP packet of size 1600 bytes passes through network segment before it reaches its destination. The header size of this packet is 30 bytes. The maximum size of an IP packet in intermediate network (MTU) is 1400 bytes. How the IP packet would be fragmented in a router. Find all the information for each fragments. *1320 frames & multiple* [2+2+6 marks]

Q10) (a) A TCP sender initiates the Connection establishment phase by sending SYN message. The first RTO=1sec default. After the 1st Transmission is successfully over, $RTT_m = 1.5$ sec. after the second Transmission, the $RTT_m = 2.1$ sec. However, the ACK of the first Data segment suffered huge delay such that it reaches after 2-Retransmissions of first Data segment. Calculate the RTT_s , RTT_D , RTO after every transmission.

$$RTO = (1 - \alpha) \times RTT + \alpha \times \text{new } RTT$$

(b) Show with suitable diagrams, TCP connection establishment and termination phases.

[5+5 marks]

Q11) (a) How do we identify whether an IPv4 address is classful or not?

(b) For the given figure, create subnets if the address of the router is **147.16.0.0**. Derive all the network information and write the subnetted IP address for 48th host in 2nd Subnet

© Explain how the switch will transfer a packet from the sender to the receiver if the Sender are- (i) in the same subnet (ii) different subnets [2+6+2 marks]

