

Mahindra University, Hyderabad
École Centrale School of Engineering
End-semester Regular Examination

Program: B. Tech. Branch: CSE, ECE, and CM Year: III Semester: II
Subject: **COMPUTER NETWORKS(CS 3203)**

Date: 29-05-2024
Time Duration: 3 Hours

Start Time: 10:00AM
Max. Marks: 100

Instructions:

- 1) All questions carry same marks
- 2) All the sub-questions of a question must be answered at one contiguous place.

Question 1. Answer the following questions:

- (a) If the TCP round-trip time, RTT, is currently 30 msec and the following acknowledgements come in after 26, 32, and 24 msec, respectively, what is the new RTT estimate using Jacobson's algorithm for Smoothed round-trip time (SRTT) computation? Use $\alpha = 0.9$. [3]
- (b) Suppose that the TCP congestion window is set to 18 KB and a timeout occurs. How big will the window be if the next four transmission bursts are all successful? Assume that the maximum segment size is 1 KB. [3]
- (c) Consider a telnet connection to an interactive editor that reacts on every keystroke. What would be the worst-case overhead of sending one character assuming TCP connection (consider only TCP and IP headers)? Briefly describe the algorithm which solves this problem. [2+2]
- (d) What are the 4 possible connection release scenarios in the transport layer? Support your answer with neat diagrams. [2]
- (e) Consider a source computer (S) transmitting a file of size 10^6 bits to a destination computer (D) over a network of two routers (R1 and R2) and three links (L1, L2, and L3). L1 connects S to R1; L2 connects R1 to R2; and L3 connects R2 to D. Let each link be of length 100 km. Assume signals travel over each link at a speed of 10^8 meters per second. Assume that the link bandwidth on each link is 1Mbps. Let the file be broken down into 1000 packets each of size 1000 bits. Find the total sum of transmission and propagation delays in transmitting the file from S to D. [3]
- (f) On a wireless link, the probability of packet error is 0.2. A stop-and-wait ARQ protocol is used to transfer data across the link. The channel condition is assumed to be independent from transmission to transmission. What is the average number of transmission attempts required to transmit 100 packets? [2]
- (g) The values of parameters for the stop and wait ARQ protocol are as given below:
Bit rate of the transmission channel = 1 Mbps
Propagation delay from sender to receiver = 0.75 ms
Time to process a frame = 0.25 ms
Number of bytes in the information frame = 1980
Number of bytes in the acknowledge frame = 20
Number of overhead bytes in the information frame = 20
Assume that there are no transmission errors. Find the transmission efficiency in %. [3]

Question 2. Answer the following questions:

- (a) Describe the DNS resolution process in step-by-step from initial query to the final response. [3]
- (b) Compare and contrast mail access protocols [3]
- (c) What are the important steps in writing a socket program for a TCP server using the Berkley Socket API? [4]
- (d) Explain how web caching is achieved with a proxy server. [3]
- (e) What are the standard ports for HTTP, FTP, SMTP, POP3? [2]
- (f) Illustrate the steps that describes how SMTP works with an example. [3]
- (g) Write a note on out-of-band data. [2]

Question 3. Answer the following questions:

- (a) What are the metrics used in RIP? Give the algorithm. Illustrate how forwarding table is updated with an example. [5]
- (b) Compare and contrast between OSPF and BGP. [3]
- (c) What is the network address for the following IP address: [2]
 - (i) IP address : 10.5.27.15 Subnet mask : 255.255.248.0
 - (ii) IP address : 172.18.12.100 Subnet mask : 255.240.0.0
- (d) What address depletion in IPv4? How it can be addressed? Explain. [4]
- (e) Write a note on the types routers used in OSPF. [3]
- (f) Distinguish between leaky-bucket and token-bucket algorithms. [3]

Question 4. Answer the following questions:

- (a) What is a care-of-address in the case of routing for mobile hosts? Explain how packets are routed from a sender to a mobile host who has moved out from home network. [1+2]
- (b) A computer on a 6-Mbps network is regulated by a token bucket. The tok bucket is filled at a rate of 1 Mbps. It is initially filled to capacity with 8 megabits. How long can the computer transmit at the full 6 Mbps? [3]
- (c) The 14th byte (bit positions 105-112) of a TCP header consists of 8 flags of size 1 bit each. State any 4 of them and explain in one sentence each. [4]
- (d) Describe the process of terminating a TCP connection with diagram. [3]
- (e) Illustrate(with diagram) the causes of congestion in TCP. [4]
- (f) Compare and contrast network assisted congestion with end-end congestion control [3]

Question 5. Answer the following questions

[2x5+5+5= 20]

- (a) List the services offered by Transport Layers.
- (b) What do mean by a frame, packet, segment and a message.
- (c) Write a note on Line configuration.
- (d) Define the following terms: (i) sampling (ii) Quantization.
- (e) A typical telephone subscriber loop has a usable audio bandwidth of 0-8000 Hz. Voice samples for digital transmission using a modem are represented in 4 bits. What is the bit rate required for the digital transport of voice?
- (f) Describe briefly the protocols used in each layer of TCP/IP with a diagram.
- (g) Define Multiplexing. Explain the types of multiplexings with diagrams.