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Amrita School of Engineering, Coimbatore

B.Tech. Degree Examinations – April 2019

Sixth Semester

Computer Science and Engineering

15CSE312 Computer Networks

Time : Three hours   Maximum : 100 Marks

Course Outcomes

CO	Course Outcomes
CO01	Understand the basic architectural components of computer networks and apply mathematical foundation to solve computational problems in computer science
CO02	Apply network application services and protocols
CO03	Analyze protocols for data transfer and flow handling mechanisms
CO04	Understand the working principle of routing devices and apply routing protocols
CO05	Understand LAN design components, Network protocols and error handling code

Answer all questions

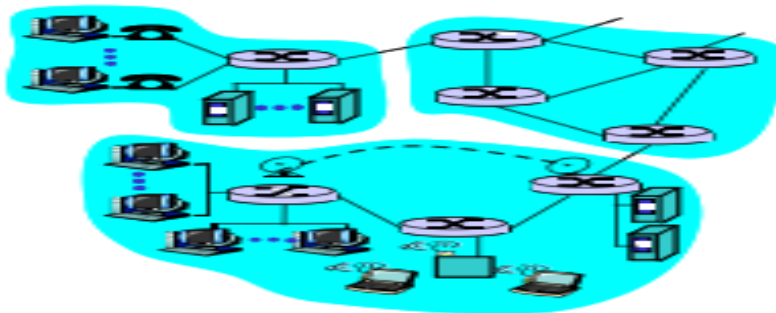**Part-A**   **(10 * 2 = 20 Marks)**

1. Mark the following in the figure given below: [2]   [CO01]
    a. Network edges
    b. Network core
    c. Links connecting access network

2. Assume the link's data rate is 2 Mbps and users are generating data at a rate of 100 Kbps. What is the maximum number of users that a circuit switching architecture can support simultaneously?   [2]   [CO01]

3. Diagrammatically represent the File Distribution in P2P architecture.   [2]   [CO02]

4. Write the request methods in HTTP protocol.   [2]   [CO02]

5. Suppose a web server has 1000 ongoing TCP connections.   [2]   [CO03]
   a. How many server-side sockets are used?
   b. How many server-side port numbers are used?

6. Give the equations for RTT estimation and DevRTT estimation.   [2]   [CO03]

7. Specify the set of recommendations given for the TCP receiver's acknowledgment generation policy.   [2]   [CO03]

8. List the categories of routing algorithms.   [2]   [CO04]

9. Show diagrammatically the consequences of running of LS algorithm on a network where link costs are not symmetric and varies with the load carried on the link?   [2]   [CO04]

10. Consider the frame with the bit pattern - 1101 1000 1001 1110. Compute the following:
    a. Even parity
    b. Two Dimensional parity(Every 4 bit is a Data)   [2]   [CO05]

Part-B   **(10 * 8 = 80 Marks)**

11. Suppose that a lunar rover robot on the Moon takes a 2 MB "selfie" photo and transmits it home to its parent robot on Earth. The transmission uses an error-free direct link with a data transmission rate of R = 4 Megabits per second (Mbps).
    a. Calculate the transmission time for this file.   **(3 Marks)**
    b. Assuming that the Moon is approximately 385,000 kilometers from the Earth, at what time would the very first bit of the photo arrive with the speed of light is approximately 3×10^8 meters per second?   **(3 Marks)**
    c. Give the Expression for the total end- end delay for its transmission?   **(2 Marks)**
                                                  [8]   [CO01]

12. Consider the figure below, where a client is sending an HTTP GET message to a web server, gaia.cs.umass.edu.

Suppose the client-to-server HTTP GET message is the following:
GET /kurose_ross/interactive/quotation9.htm HTTP/1.0
Host: gaia.cs.umass.edu
If-Modified-Since: Tue, 17 Apr 2018 00:17:16 -0700

a. What is the name of the file that is being retrieved in this GET message? **(2 Marks)**

b. What version of HTTP is the client running? **(3 Marks)**

c. Does the client already have a (possibly out-of-date) copy of the requested file? Explain. If so, approximately how long ago did the client receive the file, assuming the GET request has just been issued? **(3 Marks)**

[8]   [CO02]

13. Consider a sender and receiver that are connected by a sender-to-receiver channel that can corrupt and lose packets. The receiver-to-sender channel is perfect (i.e., it will not lose or corrupt packets). The delay on each channel is known to always be less than some maximum value, d. Neither channel will reorder packets. Design a reliable data transfer protocol for this scenario using the questions below.

Hint: If you use a mechanism that is not required, your answer will not be given full credit, even if the protocol works. Your protocol should be as simple as possible but have the functionality to reliably deliver data under the stated assumptions. Your solution need not be efficient; it must work correctly.

a. Complete the following table. **(3 Marks)**

| Mechanism	Sender(**Y/N**)	Receiver(**Y/N**)	Give reason
Checksum			
ACKs			
Timers			
Sequence number			

b. Draw the sender and receiver FSMs. **(5 Marks)**

[8]   [CO03]

14. How does the TCP sender respond to the following scenarios?

a. Sender sends four segments each of size 50 bytes after receiving ACK 495. The first segment is dropped during the transmission. Let Sequence number of first segment is 495. Draw the timeline diagram.

b. Sender sends four segments each of size 50 bytes after receiving ACK 495. The first two segments are dropped during the transmission. Let Sequence number of first segment is 495. Draw the timeline diagram.

c. Sender sends four segments each of size 50 bytes. The acknowledgment of second packet dropped during the transmission. Let Sequence number of first segment is 495. Draw the timeline diagram.

d. Sender sends four segments each of size 50 bytes and it has one unacknowledged segment with sequence number 440 before transmitting these 4 segments. The first two segments are dropped during the transmission. Let Sequence number of first segment is 495. Draw the timeline diagram.

[8]   [CO03]

15. Complete the following graph showing the congestion window size for TCP Reno assuming that the initial threshold is 8 and that a loss event will occur when the window size is 14. Recall that TCP Reno employs the fast recovery mechanism that skips slow start after a loss event timeout. Triple duplicate acknowledgement).
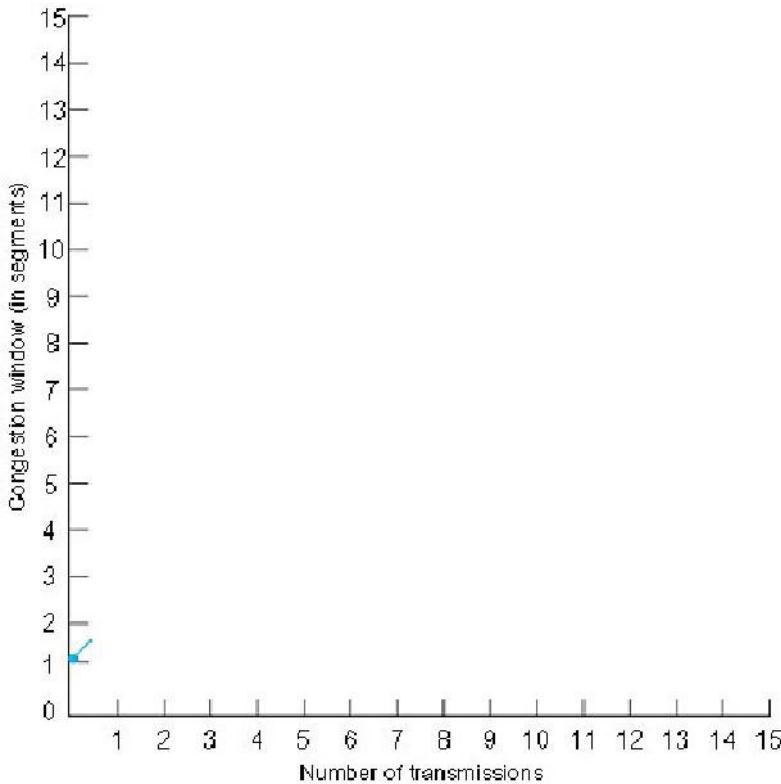

[8]   [CO03]

16.

    a. Describe the purpose of the following fields in the IP header: **(4 Marks)**
        i. Total length
        ii. Identifier
        iii. Fragment offset
        iv. Flag

    b. Consider the transport protocol in a host that is attached to an Ethernet LAN transferring a block of 7000 bytes including transport protocol header. MTU of Ethernet is 1500 bytes. Give the datagrams after fragmentation in the following tuple format (Identifier, Length, Flag, Offset, User Data length in bytes)   **(4 Marks)**
    (Note: Identifier can be of your choice)
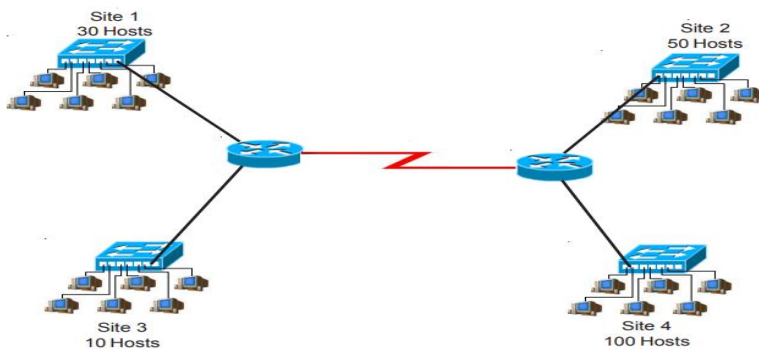
[8]   [CO04]

17. Consider the following network
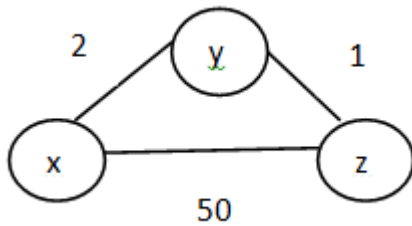
   a. Show the working of Distance Vector Routing Algorithm   **(3 Marks)**
   b. Show the routing table of each node after convergence of Distance Vector Routing Algorithm   **(3 Marks)**
   c. Consider a change in weight from x to y as 50. Show the working of Distance Vector Routing Algorithm   **(2 Marks)**
                                                                [8]   **[CO04]**

18. Using the following network diagram and information given create an addressing scheme which utilizes variable-length subnet masks (VLSM). This company will be using the class C address 199.55.78.0.

                                                                [8]   **[CO04]**
19.
   a. Suppose D (data) is 11010111011 and Generator G is10011. Find R using CRC at sender and receiver.   **(5 marks)**
   b. What is the difference between Aloha and Slotted Aloha?   **(3 marks)**
                                                                [8]   **[CO05]**

20. Discuss in detail about CSMA/CD protocol.   **[8]**   **[CO05]**

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