Final Assessment Test – July 2023

VIT
Vellore Institute of Technology

Course: **BCSE308L - Computer Networks**

Class NBR(s): **0790/0792/0794/0796/0798/0800/0802/0807/0809/0812/0813/0815/0817/0818/0819/0825/0827/0829/0833/0835/0836/0838/0840/0947/0950/1367**

Slot: **D2+TD2**

Time: **Three Hours**

Max. Marks: **100**

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN "OFF" POSITION IS TREATED AS EXAM MALPRACTICE

Answer ALL Questions

(10 X 10 = 100 Marks)

1. A trading support centre employs 600 staff members. They have recently expanded and, as a result need to move to a new building. A building has been identified but has no network. This means that before they move out, new network services need to be designed and implemented in the new building. The new building is expected to have three floors with two departments each, for example, the first floor (Sales and Marketing Department: 120 users expected, HR and Logistics: 120 users expected); the second floor (Finance and Accounts Department: 120 users expected, Admin and Public Relations Department: 120 users expected); and on the third floor (ICT: 120 users expected, Server Room: 12 devices expected).

   i. Therefore, as a member of the network design team, you have been asked to design a network for the new building by analysing the number of networking and internetworking devices required per floor. Then suggest the most appropriate topology focusing on scalability, security, and interconnectivity for an individual LAN design and to allow these LANs to connect to public Internet. **[6]**

   ii. Show the complete network topology design. **[4]**

2. Consider an application that transmits data at a constant rate (for example, the sender generates an N-bit unit of data every 'k' time units, where 'k' is small and fixed). Also, when such an application starts, it will continue its running for a relatively long period of time. Answer the following questions, briefly justifying your answer:

   i. Would a packet-switched network or a circuit-switched network be more appropriate for this application? Why? **[4]**

   ii. Suppose that a packet-switched network is used and the only traffic in this network comes from such applications as described above. Furthermore, assume that the sum of the application data rates is less than the capacities of each and every link. Is some form of congestion control needed? Why? **[4]**

   iii. What advantage does a circuit-switched network have over a packet-switched network? **[2]**

3. a) Calculate the minimum hamming distance for the following data strings: 1110, 1011, 1111, 1001, 1001, and 1001. Show the complete calculation. **[4]**

b) Suppose the following message has to be transferred to the receiver:

"HAVE A GOOD DAY"

i. Show the sender checksum calculation and verify and conclude the decision at the receiver side by assuming no error during transmission. **[Hint: HEX values for A-Z(0x41- 0x59) and empty space 0x20]** **[3]**

ii. Prove that if one or more bits of a frame are damaged and the corresponding bit or bits of opposite value in a second frame are also damaged, then the sums of those columns will not change and the receiver will not detect the errors. Assume that the leftmost hex value of frames 1 and 3 is corrupted during transmission. **[3]**

4. Write a detailed comparative analysis of, how ALOHA, Slotted ALOHA, CSMA, CSMA/CD and CSMA/CA reacts during multiple access transmission in terms of Tfr, Tp, Tb, and vulnerable time. State the reason for Tfr >=2 x Tp.

5. Consider an ISP grants Vellore Institute of Technology, Vellore with a site address as 200.3.2.0/18. The Center for Technical Support department decided to assign the addresses based on the following requirements.

Block	Number of addresses
SJT	200
TT	155
GDN	120
Pearl	264

Design the subnets, and find out the available addresses after these allocations. Provide the solution in the table form shown below for each block. **(DO NOT CHANGE THE TABLE FORMAT)**. Addresses must be given in slash notation.

SJT BLOCK	
No. of addresses needed	
Network address	
Local broadcast address	
Prefix length	
No. of usable IP addresses	
Range of usable IP addresses	

6. Consider the router receives the following alignment IPv4 header=0X49200160AB000000517000503007EEFF001A20.

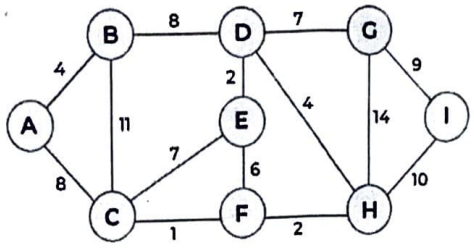
i. Draw the IPv4 datagram header format and fill the corresponding values by analysing the received datagram. Mention the addresses in dotted decimal representation. [6]

ii. Find 'is there any option?' if so how bytes of option being carried by this datagram. [1]

iii. Is this datagram fragmented? if so, check is this the first fragment, middle fragment or last fragment [2]

iv. Mention the type of data being carried by this datagram. [1]

7. i. Apply Bellman-ford algorithm to construct a routing table for node I. Depict all steps required to build routing table. [6]



ii. Assume that the links between nodes D and E fail. Discuss how this scenario is handled by the distance vector routing scheme. [4]

8. a) Explicate various traffic shaping algorithms used by the transport layer in ensuring QoS during communication. [5]

b) Consider a leaky bucket used to control liquid flow, how many gallons of liquid are left in the bucket if the output rate is 5 gal/min, there is an input burst of 200 gal/min for 12 s, and there is no input for 48 s? [5]

9. a) Brief about network management system functionalities. Elaborate on the application layer responsible for rendering the above network management services. [6]

b) Identify the application layer and transport layer protocols for the following day-to-day networking services. [4]

i. Searching
ii. Online ordering and transactions
iii. Email services
iv. File upload and download

10. a) "Now-a-days, cybercrimes and cyber-attacks are increasing in all fields". Do you agree with this statement? If so, analyse and provide reasons for the same. [2]

b) Identify and explain in detail about any 4 cybercrimes against an individual in India. From your own perspective, suggest appropriate counter measures for each those cybercrimes in order to mitigate. [8]

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