# VIT
**Vellore Institute of Technology**
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

## Continuous Assessment Test (CAT) – II - MARCH 2025

| Programme | : | B. Tech (CSE and its specialisations) | Semester | : | Winter 24-25 |
|---|---|---|---|---|---|
| Course Code & Course Title | : | BCSE308L – Computer Networks | Class Number | : | CH2024250501770 CH2024250502124 CH2024250502306 CH2024250502307 CH2024250503127 |
| Faculty | : | Dr. PRADEEP K V Dr. MENAKA PUSHPA A Dr. SHYAMALA L Dr. DINAKARAN M Dr. SANGEETHA N | Slot | : | D1+TD1 |
| Duration | : | 1½ Hours | Max. Mark | | 50 |

**General Instructions:**
- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted

### Answer all questions

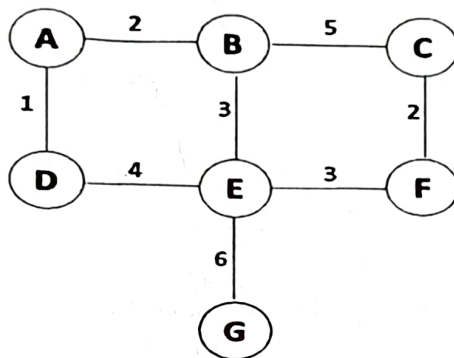| Q. No | Sub Sec. | Description | Marks |
|---|---|---|---|
| 1. | | ABC Logistics, a global supply chain management company, recently upgraded its **warehouse automation system** to integrate **IoT-based smart sensors** for real-time inventory tracking. These sensors communicate with a **central database server** over a **wireless network**, which relies on **data link layer protocols** for efficient communication. However, after deployment, the company encountered several issues: <br> • **Frequent data transmission failures and congestion** due to multiple IoT sensors transmitting data simultaneously. <br> • **Packet loss and varying processing speeds** between the sender (**IoT sensors**) and the receiver (**central server**). <br> • **Delays in acknowledgments**, causing **inventory mismatches** in the tracking system. <br><br> To improve communication, the IT team decided to implement the **Selective Repeat ARQ Sliding Window Protocol** with a **window size of 7**. The IoT Sensor initiates **data transmission** to the **Central Server**, sending **25 packets** in total. It is observed that **every 5th packet gets lost** due to congestion and network interference. <br><br> (i) **Depict the transmission timeline diagram** for **Selective Repeat ARQ**, considering the **given data loss pattern**. Clearly show **lost, retransmitted, and successfully acknowledged frames.** (4 Marks) | 10 |

(ii) Based on the given scenario, calculate the following: **(5 Marks)**
- Total number of frames sent successfully without retransmission.
- Total number of transmissions required to send all 25 frames.
- Total number of lost frames.
- Total number of discarded frames.
- Total number of retransmitted frames.

(iii) If the network bandwidth fluctuates, leading to additional random losses of frames 8 and 17, how many total retransmissions would be required in this new scenario? **(1 Mark)**

| | | | |
|---|---|---|---|
| 2. | (i) | Compare and list the difference between ALOHA and Slotted ALOHA with respect to its vulnerable time, throughput and efficiency. **(3 Marks)** | 10 |
| | (ii) | Based on above comparison find out the maximum number of stations that the following Network can support when it employees (a) ALOHA (b) Slotted ALOHA. **(7 Marks)**<br><br>A 128 Kbps channel is going to be shared among "N" number of stations. Each station will send a 512 byte frame on average for every 5 seconds. | |
| 3. | (i) | The industry wants to run with 3 major departments such as customer support, operation control, and development & testing. Each department has the following characteristics:<br>• Customer Support will work in three units with 800 employees<br>• Operation control will work in 5 major units and each unit operate with less than 50 employees<br>• Development & Testing operate under 2 units with nearly 10,000 employees in each unit<br>In the above requirement, find the following answers;<br>(a) Classful IPv4 address classes of each department with proper justification under optimal cost **(5 Marks)**<br>(b) Calculate the required number of IPV4 addresses of each department and unit **(3 Marks)** | 10 |
| | (ii) | Convert the following IPV4 address into Hexa-decimal representation and find its class **(2 Marks)**<br>11100000 00000011 10101110 00010100 | |
| 4. | | A University Software Development Team is granted with a block 192.168.0.0/22, which contains 1024 addresses. The software development team has to efficiently subnet the given block for the four different subgroups of the university such as faculty group, student group, research department group and security group that requires 256, 256, 128 and 64 addresses respectively. Suggest a | 10 |

suitable IP addressing scheme to design the subnet for each subgroup.

   (i)  For each subgroup, find out the subnet mask, network address, broadcast address, and network range and usable addresses.  **(8 marks)**

  (ii)  Find out how many addresses are still available after these allocations for future use. **(2 marks)**
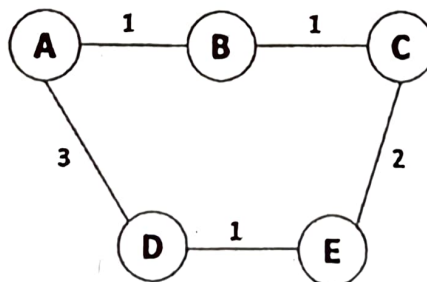
  (i) Consider a network of 7 routers (**A, B, C, D, E, F, and G**) connected as follows with given link costs:

At each iteration write the routing tables of each router with proper justification. **(5 Marks)**



1. Apply the Decentralized routing algorithm to compute the routing tables of all the nodes in the network after Iteration-1 and Iteration-2 (i.e., after 2 passes)
2. Compute the complete routing table of all the nodes after Convergence.

  (ii) The aforementioned network has undergone the following modifications after some time as below: (5 Marks)



When the link between C and E fails, calculate the vector tables for each node. B and D continue to promote their previous routes to C and E since they still possess out-of-date knowledge. Provide a solution to stop issues from happening when creating vector tables.

**5.**                                 **10**

**********All the best ************