

USN: 1 R V U 2 3 C S E 5 3 9

Section:

Q1 needs to be attempted on CodeTantra. Use your Answer Booklet to write and illustrate questions - Q2, Q3, Q4, Q5.

Q1. Complete a Doubly linked list program (refer program template given at the end of paper) to (10M)
maintain a list of item-numbers, their corresponding quantities and weight per unit.
Implement the following operations for this list:

- **I iNum, iQ, iWPU** – Inserts a new node at the end of DLL with values item-number as 'iNum', item-quantity as 'iQ', and weight per unit weight of this item as 'iWPU'.
- **S** – Print sum of quantities of all the items present in DLL. Will only print an integer, i.e. the sum of quantities of all the items
- **D** – Delete a node from DLL having the least item-quantity 'iQ' value.
- **P** – Prints the contents of the remaining DLL, each node, one per line.

After the execution of each insertion or deletion operation, display the updated contents of the linked list.

Input format:

First line mentions the operations to be executed, say **n**. The following **n** lines will be operations in the format as mentioned above.

Output format:

The output corresponding to each operation gets displayed one per line.

Sample Input:	Sample Output:	Explanation:
6		The # of operations to be executed
I 7 10 5	7 10 5	"I 7 10 5" inserts the first node in the DLL, so "7 10 5" gets printed.
I 2 5 100	7 10 5 2 5 100	"I 2 5 100" inserts the second node in the DLL.
P	7 10 5 2 5 100	"P" Values of two nodes. "7 10 5" and "2 5 100" get printed in two separate lines.
S	15	"S" displays 15, i.e. sum of quantities 10 and 5.
D	7 10 5	"D" deletes the item with least quantity.
P	7 10 5	"P" prints the remaining contents of the DLL. Only one node remains and it gets printed.

Q2. A Circular Singly Linked List that stores items of a bakery: (5M)

Node Items are:

- o Name of the Item
- o Quantity
- o Price

Do the following - concentrate on node pointer address changing. *Full program is not expected.* Write down only what you are asked to do. Illustrate = "on pen and paper".

- a) Write down in 'C' the structure definition of the above node
- b) Illustrate four nodes of this CSLL. The items' names must be "Bread", "Donut", "Rusk", "Toffee".
- c) Illustrate when a node ("Bun") is inserted into this list before "Donut".
- d) Illustrate when the node "Toffee" is removed from this list.
- e) Write down in 'C' only the pointer reallocations that are done in order to accomplish **either #c or #d**.

Q3. Which dynamic memory allocation function allocates a *single* block of memory? Give its correct syntax. (2M)

Q4. Let there be a integer pointer, say *iptr*, pointing to a memory block to store 7 integers. Write the correct syntax to reallocate *iptr* with an updated memory block to store 12 integers. If reallocation is successful then print *ONE*, else *ZERO*. (2M)

Q5.

(a) There are n=4 disks in the Tower of Hanoi Problem. Draw the Call Stack to depict until the movement of the largest disk to the destination tower. (4M)

(b) How many moves are required to do this? Justify your answer mathematically. (2M)

Program Template for Q1:

```
#include<stdio.h>
typedef struct itemNode
{   int iNum, iQ, iWPU;
    struct itemNode *prev, *next;
}node;

node* insertEnd(int *head, int itemNum,
int itemQ, int itemWPU)
{
    node *temp = (node *) malloc
(sizeof(node));
    if(temp != NULL)
    {
        temp->iNum = itemNum;
        temp->iQ = itemQ;
        temp->iWPU = itemWPU;
        temp->next = temp->prev = NULL;
        _____
    }
    return head;
}
_____
```

```
int main()
{
    int n, itmN, itmQ, itmWPU, DLL = 1;
    char ch;
    node *head = NULL;
    scanf("%d",&n);
    while(n > 0)
    {
        scanf(" %c",&ch);
        if(ch == 'I')
        {
            _____
        }
        else if(ch == 'S')
        {
            _____
        }
        else if(ch == 'D')
        {
            _____
        }
        else if(ch == 'P')
        {
            _____
        }
        n--;
    }
}
```