



School of Computer Science Engineering and Information Systems

Fall Semester 2023-2024

Continuous Assessment Test – I

Programme Name & Branch MCA

Course Name & code: Data Structures and Algorithms , PMCA501L

Class Number (s): VL2023240106168, VL2023240106164, VL2023240106145

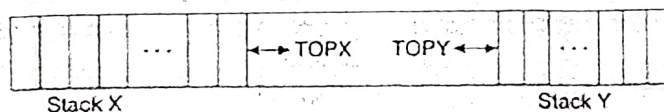
Faculty Name (s) Dr.N.Mythili, Dr.R.Seetha, Dr.M.Iyapparaja

Exam Duration: 90 Min.

Maximum Marks: 50

General instruction(s): Answer all questions (5*10 = 50 Marks)

1. a) Consider an array of size 10 with four elements stored in it. If each data takes 4 bytes to store, then compute the memory requirement of the array. If a linked list requires 4 bytes to store the address, then what is the memory requirement of a linked list? Compare both the cases and justify which data structure is better in the given scenario. Also differentiate them (6)
- b) Elaborate the role of stack frames in function calls. (4)
2. Assume that patients arrive at a hospital at random intervals. At times emergency cases do arrive. Suggest a suitable ADT to simulate the order in which the patients are treated. Discuss a pseudocode for this simulation (10)
3. In several applications, more than one stack may be required together. Some stacks overflow whereas others are nearly empty. Suppose an application requires two stacks X and Y (as below figure). One can define an array A with N_x elements for stack X and another array B with N_y elements for stack Y. Now instead of defining two separate arrays A and B, we can define a single array, say AB, with $N = N_x + N_y$ elements for X and Y together. Let us define the starting locations of items for stack X and Y as AB[0] and AB[N-1] respectively and X grows to the right whereas Y grows to the left.



With this scenario, overflow will occur only when X and Y together have more than N elements. This technique will usually decrease the number of situations of occurrence of overflow even though we have not increased the total amount of space reserved for the two stacks.

Write algorithm for PUSH_X, PUSH_Y, POP_X, POP_Y and STATUS_AB (to be defined to test the state of empty or full, percentage of space occupied by X and Y) by considering the above said scenario. (10)

4. a) Perform the following for the given code.

```
struct node
{
    char data;
    struct node *next;
};

main( ) {
    struct node *n1, *n2, *n3, *temp;
    n1 = (struct node*) malloc(sizeof (struct node));
    n2 = (struct node*) malloc(sizeof (struct node));
    n3 = (struct node*) malloc(sizeof (struct node));
    n1->next = n2;
    n2->next = n1;
    n3->next = n2;
    temp = n3->next;
}
```

(i) Mention the successor node for each of the 3 nodes created in the above program. [1]

(ii) Which node is the successor for 2 nodes? [1]

(iii) Which is the node pointed to by “(temp->next)->next” [1]

(iv) From which node if you start, you will be able to visit (display) all the three nodes, by following the links? [2]

(b) Write a code snippet to count the number of nodes in a singly linked list and illustrate it. [5]

5. a) Write the pseudocode to perform deletion of a node specified by the user from a circular singly linked list. Trace the execution of the algorithm (6)

b) What is an ADT? (2)

c) Mention the disadvantages of circular and singly linked lists (2)