(Please write your Enrollment Number)

Enrollment No. ____

MID-TERM EXAMINATION
(Course Name : B. Tech. CSE) (Semester : 3rd)
(October 2024) OFF LINE mode

Subject Code: BCS 201		
Time : 1 ½ Hours		Subject: Data Structures
		Maximum Marks :30

Note: Q1 is compulsory. Attempt any two parts of Q2 and Q3

Q1		
		(2.5*4=10)

a)	Consider the below given function in pseudocode:
	
	function ( )
	{ While (N>1) do
	    for i = 1 to N do
	    Print("Hello");
	    End for
	    $N = \lfloor N/2 \rfloor;$
	End While }
	
	How many times Hello will be printed? **Justify your answer.**	

b)	Consider a sequence A of elements $A_0 = 1, A_1 = 5, A_2 = 7, A_3 = 8, A_4 = 9,$ and $A_5 = 2$. The following operations are performed on a stack S and a queue Q, both of which are initially empty. I: push the elements of a from A_0 to A_5 in that order into S. II: enqueue the elements of a from A_0 to A_5 in that order into Q. III: pop an element from S. IV: dequeue an element from Q. V: pop an element from S. VI: dequeue an element from Q. VII: dequeue an element from Q and push the same element into S. VIII: Repeat operation VII three times. IX: pop an element from S. X: pop an element from S. What is the top element of S after executing the above operations?	

c)	Consider the following recursive functions written in C language:
	
	`int fun1(int n) {`
	`    static int i = 0;`
	`    if (n > 0) {`
	`        ++i;`
	`        fun1(n-1);`
	`    }`
	`    return(i);`
	`}`
	
	`int fun2(int n) {`
	`    static int i = 0;`
	`    if (n > 0) {`
	`        i = i + fun1(n);`
	`        fun2(n-1);`
	`    }`
	`    return(i);`
	`}`
	
	What will return the above code when fun2(5) is called? **Justify your answer.**	

d)	The following C function takes a single-linked list of integers as a parameter and rearranges the elements of the list. The function is called with the list containing the integers 1,2,3,4,5,6,7 in the given order. What will be the contents of the list after the function completes execution? **Justify your answer.**	

```
struct node {
    int value;
    struct node *next;
};

Void rearrange (struct node *list ){
    struct node *p, * q;
    int temp;
    if( !list || !list-> next) return;
    p = list; q = list->next;
    while (q) {
        temp = p->value;
        p-> value = q ->value;
        q-> value = temp;
        p = q-> next;
        q = p ? p->next : 0;
    }
}
```

UNIT I

Q2	**Attempt any two parts**	(5*2=10)
a)	Given an array of integers, devise an O(N) time complexity algorithm to rearrange the array so that even-indexed elements are even and odd-indexed elements are odd. Highlights the constraints on the solution, if any.	
b)	Let A be a two dimensional array declared as follows: A[1...10][1...15] of integer; Assuming that each integer takes one memory locations the array is stored in row-major order and the first element of the array is stored at location 100, what is the address of the element A[i] [j]?	
c)	The input is an N x N matrix of numbers that is already in memory. Each individual row is increasing from left to right. Each individual column is increasing from top to bottom. Devise an O(N) worst-case algorithm that decides if a number X is in the matrix.	

UNIT II

Q3	**Attempt any two parts**	(5*2=10)
a)	Write an algorithm to sort a stack in ascending order using another stack for temporary storage. Analyze the complexity of your approach and discuss possible boundary cases if any.	
b)	Use queue and stack to implement an algorithm to check if a given string is a palindrome. Analyze the complexity of your approach and discuss possible boundary cases if any.	
c)	Given two linked lists, write an algorithm to find the intersection point of the two lists, if it exists. Analyze the complexity of your approach and discuss possible boundary cases if any.	