Section - (B)

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QUESTION PAPER

FINAL TERM EXAM 2022

SUBJECT: DATA STRUCTURE AND ALGORITHMS ANALYSIS

TOTAL TIME ALLOWED: 2.5 Hours **MAX. MARKS:** 50

Note:
Cutting/Overwriting will be considered as wrong answer. Attempt any five Questions.

Question # 1: **(5*2 =10 - marks)**

(a) Draw the binary search tree that results from inserting the numbers below starting with 70 and ending with 62.

70, 11, 47, 81, 20, 61, 10, 12, 13, 62

(b) For the tree above list the nodes in a *preorder* traversal.

(c) For the tree above list the nodes in a *postorder* traversal.

(d) For the tree above list the nodes in an *inorder* traversal.

(e) Which case applies to delete element 11. Show steps and Redraw tree after deleting 11.

Question # 2: (a) Sort the elements of the following array using top-down merge sort approach. Show all operations (Lo-mid-hi indexes and merge operations). Elements Ascii values are their order. **(4 – marks)**

Cat	Bit	Hat	Mat	Rat	Bat	Hot	Bot	Sit

(b) Draw graph from given adjacency matrix and answer questions. **(6 – marks)**

	A	B	C	D	E	F
A	2	1	0	0	1	0
B	1	0	1	0	1	0
C	0	1	0	1	0	0
D	0	0	1	0	1	1
E	1	1	0	1	0	0
F	0	0	0	1	0	0

1) Is it directed or undirected graph? Yes/No Why?

2) Is it weighted or unweight graph? Yes/No Why?

3) Is it cyclic or acyclic graph? Yes/No Why?

4) Is there any self-edge in it? Yes/No Which?

5) What is path cost from vertex 1 to vertex 4.

OR

(b) Write a complete stack class that is based on singly linked list. Implement push and pop methods.

Question # 3: (a) Write algorithm and Apply DFS on given graph. **(7 - marks)**

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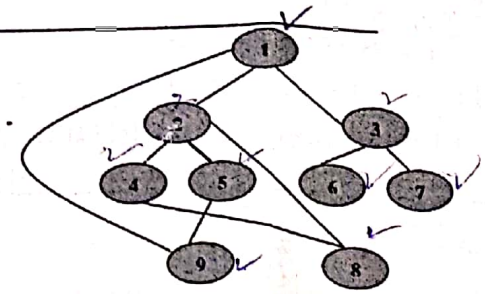

OR

(a) The sorted sub-arrays are 34, 56, 67, 78, 89, 99 and 23, 53, 76, 98, 90. Dry run the Merge algorithm using a table.

(b) Which type of data structure is represented by following class? Justify your answer.

(3 - marks)

```
Class Mystry
{
        int data;
        Mystry * nexr, *prev;
}
Class secret{
        Mystry * First;
        void insertLast(int x){
        Mystry * N=new . . . . . .;// assume yourself
        if(!First)  {First=N;  First->next=First, First->prev=First;}
}}
```

Question # 4: Write an algorithm that finds and removes duplicate nodes from a doubly Linked List. Consider the following scenarios, just for example before and after applying your function.

(10 - marks)

Before:	24	25	28	12	24	30	28	25	45	65	12
After:	24	25	28	12	30	45	65				

OR

(a) Construct min-heap from following elements. Show resultant heap and final tree representation.
71, 23, 89, 90, 45, 93, 67, 43, 92, 09, 123, 94, 83, 372, 75, 83, 56 **(4 - marks)**

(b) Remove two elements from head (one by one) from heap and show steps. **(2 - marks)**

(c) Now insert last removed element again into heap. (draw final heap in array only) **(1 - marks)**

(d) Write algorithm for heap_insert and heap_remove procedures. **(3 - marks)**

Question # 5: (a) Sort the elements of the following array using radix sort. Show all iterations. Elements first ascii are their numerical order.

(5 - marks)

Cart	**Bun**	**Hut**	**Mud**	**Roast**	**Boat**	**Goat**	**Swim**	**Fun**

OR

(a) Draw the expression tree of expression. (4*5)/(5-6)^2 + 5^2*4/6. Then apply correct traversal order (pre/post/inorder) to get its equivalent postfix expression.

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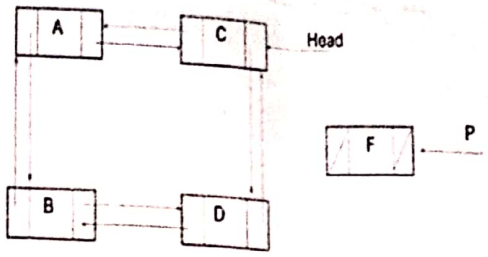
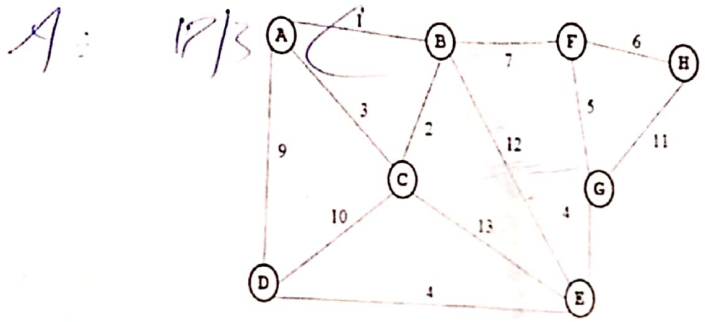
(b) The diagram below is a Circular-Doubly Linked List data structure. (head means first) Provide the necessary algorithm/code to add the new node pointed by P to the list at the end. Such that, the list must be kept circular and doubly linked list. **(5 - marks)**



Question # 6: (a) Evaluate postfix expression 7 8 + 3 2 + / using a stack. **(5 - marks)**

(b) Design the adjacency list for given graph. **(5 - marks)**



OR

(b) Following is an unsorted array.

43, 14,15, 76,34, 26, , 43, 98, 55.

Simulate one step of quicksort by selecting last element as pivot, finding its rank, placing/swapping it on its rank position and then partitioning around it. Partitioning should be dry run using a table.

SET A

MID TERM EXAM 2021 (SUBJECTIVE)

SUBJECT: DATA STRUCTURE AND ALGORITHMS ANALYSIS

TOTAL TIME ALLOWED: 40 MINUTES **MAX. MARKS:** 10

Note: Cutting/Overwriting will be considered as wrong answer. This paper is closed {books + notes + ~~neighbours~~}. Attempt any 4 questions. (2.5 marks each)

Question # 1: Given an array of elements, sort these elements using a stack. Input : 8 5 7 1 9 12 10

Question # 2: Write an algorithm that inserts elements in a circular priority queue.

Question # 3: Stack S of size 10 initially contains elements 4, 5, 7, 6, 2,3, 4, 9, 7.

When pop is applied, element is displayed on output. If stack is empty, output shows "E". Push(x) insert elements into stack. If stack is full, output shows "F". Following sequence of operations is applied.

Push(32), Push(98), Pop, Pop, Push(10), Pop, Pop, Push(23), push(130), pop, pop, pop, pop, push(54), push(87), pop, pop, pop, pop, pop.

Now show final stack and also what is written on output.

Question # 4: Write algorithm and dry run bubble sort on given input.[9, 3, 1, 8, 5, 2, 4]

Question # 5: What is the output of following algorithm and what data structure is/are used.

```
int x; int *p; int *q;
p = new int[10]; q = p; *p = 4;
for (int j = 0; j < 10; j++)
{
    x = *p;
    p++;
    *p = x + j;
}
```

```
for (int k = 0; k < 10; k++)
{
cout << *q << " ";
q++;
}
cout << endl;
```

Question # 6: Stack S1 contains random numbers. Stack S2 can be used as temporary stack. Write an algorithm to sort numbers in S1, using push,and pop functions. (empty and full checks can also be used). Only two temporary variables can be used.

Question # 7: Here is a 2-D Array and the element at ith row and jth column position is Aij. . What elements are at given positions X1, X2 etc.
(hint: upper left element is A[i-1][j-1]).