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, pop.

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

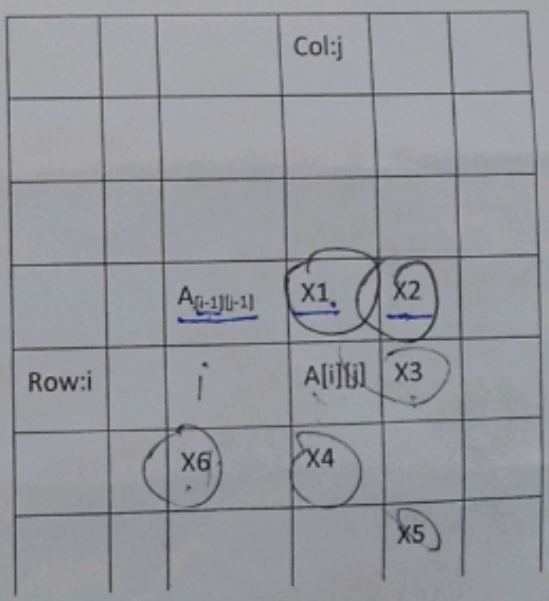
Question # 4: Write algorithm and dry run bubble sort on given input.[9, 3, 1, 8, 5, 2, 4]

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]).



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1. A data structure that keeps track of incoming jobs such that highest priority job is executed first, even if it was inserted at any time is.....

a. Simple Queu	b. Circular Queue	c. Priority Queue	d. sOrted stack

2. Minimum how many stacks are needed to implement as a queue

a. 9	b. 5	c. 2	d. 1

3. A special type of pointer that can point to any data type is

a. Arbitrary pointer	b. Void pointer	c. Class	d. Reference pointer

4. Let A be a square matrix of size n x n. Consider the following program. What is the expected output?

```
C = 10
for i = 1 to n do
for j = 1 to n do
{
  Temp = A[i][j] + C
  A[i][j] = A[j][i]
  A[j][i] = Temp - C
}
for i = 1 to n do
for j = 1 to n do
Output(A[i][j]);
```

a. The matrix A itself	b. Transpose of matrix A	c. Adding 100 to the upper diagonal elements & subtracting 100 from diagonal elements of A	d. None of the above

5. Consider an integer array A[20], the base address of array A is 520. What is the address of A[11] ?

a. 560	b. 565	c. 570	d. 575

6. **What will the value stored in variable X after following code?**
   Int X=20, Y=40; int * Xptr=&Y, int * Yptr=&X;
   *Yptr=++X;*Xptr=*(Yptr++) (Garbage Value)

7. **Why all Brute force sorting algorithms have running cost N^2?**
   Brute force sorting algorithm performs all possible iterations/comparisons.

8. **Indicate why Insertion Sort is faster than bubble sort?**

9. **Post and pre increment operators for any pointer data type are overloaded such that they add /subtract 4 instead of 1. Why**

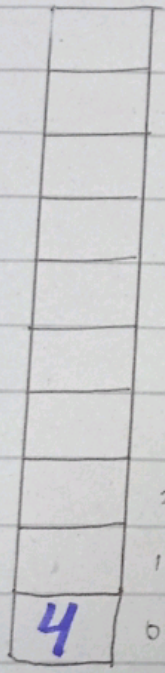
10. What does this algorithm do. what data structure is used? If there some fault, indicate it. Also write corrected algo. (A is array of N size)

If(count = = N) return false else {A[tail++]=X;if(i==){ i=0;} return true}

This algorithm is for enqueue in a circular type of Queue.

```
if (count = = N)
  return false;
else {
  A[tail++] = X;
  if (i = = N)
  { i=0; }
}
return true;
```

Q. No. 3



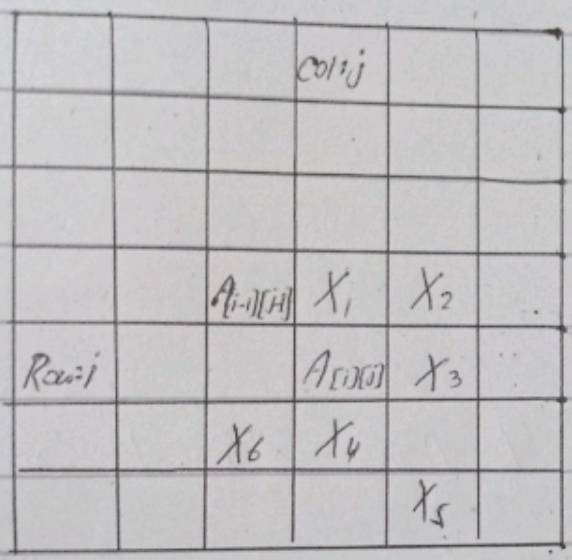
(Final Stack)

Output :

F 32 7 10 9 130 23 4 3 87 54 2 6 7 5

2.5

Q. No. 7



Elements at positions X_1 and X_2 are:

X_1 : $A_{[i-1][j]}$, X_2 : $A_{[i-1][j+1]}$

Q. No. 4

Algorithm of Bubble Sort to Sort following sequence [9, 3, 1, 8, 5, 2, 4]

Algorithm:

```
for ( i=0 to  i→(size-1) )
{
   for ( j=0 ; j < (size-i)-1 ; j++)
   {
      if (A[j] > A[j+1])
      {
         ~~sort~~ Swap ?
      }
   }
}
```

9 3 1 8 5 2 4

3 1 8 5 2 4 9
1 3 5 2 4 8 9
1 3 2 4 5 8 9

1.5

Q. No. 5

Output : 4 4 5 7 10 14 19 25
32 40

2.5

32 9
10 8 130
23 7
37 6
54 5
2 4
6 3
7 2
5 1
4 0

0 1 2 3 4 5
4; 4; 5; 7; 10; 14; 14
6 7 8 9
25; 32; 40; 49

(F) 32 7 10 9 130 23 4 3
37 54 2 6 7 5

Q. No. 1

We will sort the given array by using Tower of Honai

Source	Temp	Destination
10		
12		
9		
1		
7		
5		
8		
12		
9	10	
1		
7		
5		
8		

9

1

7

12

10