IIT Delhi MS by Research ScAI Dept Written Test and interview

Date May 14, 2022, Time 2 pm to 5pm 3 hours test

41 questions MCQ MSQ NAT each of 1.5 or 3 marks

3 que programming 10 marks

Syllabus:

Calculus Differentiation, Integration, Partial derivatives, Nested integration, Polar coordinates, etc.

Linear algebra Vectors, Linear equations, Vector spaces and subspaces, Orthogonality, Determinants, Eigenvalues and eigenvectors.

Probability Basic probability, Random variables, Sampling, Parameter estimation, Regression.

Algorithms Asymptotic notation, Divide and conquer, Sorting, Searching.

Questions

1) which is stable sort algo?

2) 4-5 aptitude questions --- circular sitting, row wise sitting, 1 Profit loss, 1 time work, DELHI typed as CEDFKMGIHJ then BOMBAY == ?, angle between hour and minute hand at 6:15 pm, venn diagram etc

3) how many edges in transitive closure of Directed graph of n edges?

4) correct probability distribution of Bayesian network drawn below.

5) some 6-7 que on Machine learning neural nets etc. (I didn't know any of this)

6)f(z)=(1/(1+ e^(-z))) what is f(-z), f(1-z), f'(z) etc

7) array given, basic stack operations given and find final state of stack .

8) matrix given find maximum eigen value?3-4 time complexity ques. (2n)^n and n^(2n) etc

9) recursive code given on tree find final answer called fun(root,3) full bin tree of 7 nodes given

```
Fun(root,sum)
{
        If(!root)
                Return sum;
```

```
        Else
        {
                Sum=sum+fun(root->left,sum);
                Sum=sum+fun(root->right,sum);
                Return sum;
        }
}
```

10) rank of matrix que

11) probability density fn given find E(Y) where Y=3x^2 – 2x^3

12) one eigen value fiven of its corresponding two eigen vectors given find |A| determinant

13) 10 circles c1,c2,c3….c10 , radius of Ci=2*i find area of all of them.

14)3x^2 – 4x+1 in defined in [-1,1] for x= what maxima and minima occurs

15) total no of squares formed in 8*8 chessboard

Programming ques: 10 mark each

1) m*n matrix given, find total no. of possible ways from 0,0 to m,n going through p,q

Where 0 < p < m-1 and 0 < q < n-1.

Similar to this

https://www.geeksforgeeks.org/count-possible-paths-top-left-bottom-right-nxm-matrix/

2) Directed graph given a matrix mat[i][j] => edge time from i to j.

Return all the nodes who have their difference of (outgoing – incoming) maximum amond all nodes difference

E.g. Answer returned is node 0,2 as max =2

nodes	0	1	2
0	0	2	4
1	1	0	2
2	3	5	0

Nodes	Out	In	diff
0	6	4	2
1	3	7	-4
2	8	6	2

3) hash map related question easy one

Result declared on 26th May 4pm **(Selected for Interview)**

Interview

Interview Date 2 June 2022 (Did not appeared as already got MS by Research in CSE IIT Bombay)