**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)