**Fourth Semester**
**B.Tech.**

**MID TERM EAMINATION**                                    **MARCH-2023**
**CO208 - ALGORITHM DESIGN AND ANALYSIS**

Time-1:30 Hours
                                                          Max. Marks-25

Note: Answer all questions. Write pseudo codes for all algorithms asked.
Assume suitable missing data, if any.

Q1. (a)Solve the following recurrence relations (use any method)
     (i)   $T(n)=6T(n/3)+n^2 \log n$
     (ii)  $T(n)=2T(\sqrt{n})+\log n$
  (b)Find the time complexity of the following program
    void fun(n)
    {

        int i, j, count=0;
        for(i=n; i>0; i=i/2)
            for(j=0;j<=i; j++)
                count++;

    }

                    **[2+2+2=6M][CO1]**

Q2. Using divide and conquer approach, write a recursive function to find the maximum and minimum elements of a set containing $2^n$ elements. Also write the recurrence relation for the same and solve the recurrence relation.

                    **[3+1+1=5 M][CO2]**

Q3. Given a sorted array of distinct integers A[1, . . . , n], you want to find out whether there is an index "i" for which A[i] = i+1. Give a divide-and-conquer algorithm that runs in time O(log n)

                    **[4 M][CO2]**

Q4. Given the following jobs, their deadlines and associated profits as shown below. The jobs are to be scheduled on a uniprocessor system. The profit against a job can only be awarded, if it is completed within its deadline limit.

                    **[5M][CO3]**

| Jobs | J1 | J2 | J3 | J4 | J5 | J6 |
|---|---|---|---|---|---|---|
| Deadlines | 5 | 3 | 2 | 2 | 4 | 1 |
| Profits | 200 | 180 | 190 | 300 | 120 | 100 |

Using the greedy approach, answer the following questions-

    a. Write the optimal schedule that gives maximum profit.
    b. Are all the jobs completed in the optimal schedule?
    c. What is the maximum earned profit?

Q5. Find the minimum spanning tree of the graph given below using Prim's algorithm. Assume vertex $v_6$ as the source vertex.     **[5M][CO4]**