

**B.E. (Computer Engineering) (Insem)**  
**DESIGN AND ANALYSIS OF ALGORITHMS**  
**(2019 Pattern) (Semester - VII) (410241)**

*Time : 1 Hour]**[Max. Marks : 30]**Instructions to the candidates:*

- 1) Answer Q.1 or Q.2, Q.3 or Q.4.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figure to right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1) a)** Prove the correctness of the following algorithm, which finds the minimum number from the given array of n numbers.

```

int min_element (int A [ ])
{
    min=A[0];
    for (i=1; i<n ; i++)
    {
        if (A[i]<min) then
            min=A[i];
    }
    return(min);
}

```

[7]

- b)** What is iterative algorithm? Explain iterative algorithm design issues using examples. [8]

OR

- Q2) a)** Prove the correctness of the following algorithm, which finds the factorial of a given number.

```

int fact (int n)
{
    if (n==0) then return 1;
    else
        return (n * fact(n-1));
}

```

[7]

- b)** Write a short note on any four problem solving strategies. [8]

**Q3) a)** Consider the algorithm for selection sort:

```
void select (int A[ ])  
{ // A is an array of n numbers.  
    for (i=1;i<n-1; i++)  
    {  
        min_pos=i;  
        min_val=A[i];  
        for(j=i+1; j<=n; j++)  
        {  
            if(A[j] < min_val) then  
            {  
                min_pos=j;  
                min_val=A[j];  
            }  
        }  
        A[min_pos]=A[i];  
        A[i]=min_val;  
    }  
}
```

Analyse the complexity of this algorithm. Clearly indicate the assumptions made, if any. [6]

- b) If an algorithm has a time complexity of both  $O(f(n))$  and  $\Omega(g(n))$  for the same function  $f(n)$  and  $g(n)$ , then what does it imply? Explain. [3]
- c) What do  $\Omega$  and  $\Theta$  notations mean? When do we use  $O$  notation? [6]

OR

- Q4) a)** What is polynomial time reducibility? What is its importance in computational complexity theory? [6]
- b) What do understand by NP complete and NP hard problems? Give examples. [6]
- c) Is  $6n^3 = \Theta(n^2)$ ? Justify your answer. [3]

