B.E./B.TECH. Degree Examination, January 2021

Semester IV

IT16401 Paradigms of Algorithm Design

(Regulation 2016)

Time:Threehours Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. Which of the following algorithm design strategies is effective to sort a set of N keys?
   (a) Divide and Conquer (b) Brute Force (c) Dynamic Programming (d) Backtracking
2. Which of the following symbols is not an Asymptotic notation?
   (a) O (b) Σ (c) Θ (d) Ω
3. Which of the following problems is of type NP Complete?
   (a) Searching (b) Sorting (c) Vertex Cover (d) Chain Matrix multiplication
4. How many colors are required at the minimum to color a bipartite graph?
   (a) 4 (b) 3 (c) 2 (d) 5
5. Calculate the Asymptotic time complexity of the following algorithm

```
Algo(N) # N is an exact power of 2
While(N>0)
   Display HELLO
   N= N/2
```

6. Devise a recursive algorithm to find the factorial of a number.
7. Justify how memorization helps in Dynamic Programming.
8. Differentiate mutation and crossover in the context of genetic algorithms.

PART B - (4 X16 = 64 marks)

9. (a) Devise an efficient algorithm to sort the given set of random keys in decreasing order. Apply the algorithm for the instance <1,2,3,4,5,6,7,8> **(16)**

(OR)

(b) Devise an algorithm to calculate the minimum number of scalar multiplications required to multiply a chain of matrices. Apply the algorithm for the instance **(16)**
A: 4 × 10, B: 10 × 3, C: 3 × 12, D: 12 × 20

10. (a) Devise an algorithm to solve the sum of subset problem. Apply the algorithm for the instance M = 21, N = 5, n_1 = 5, n_2 =6, n_3 = 10, n_4 = 11, n_5 = 16. **(16)**

(OR)

(b) Devise an algorithm to solve the 0/1 Knapsack problem using Dynamic Programming. Apply the algorithm for the instance N=4, W =16 **(16)**

Profit ={40,30,50,10} Weight = {2,5,10,5}

11. (a) Illustrate the following classes of problems with suitable examples. **(16)**

(i) Class P (ii) Class NP (iii) NP Complete (iv) NP Hard

(OR)

(b) Justify how an approximate optimal solution for the Travelling Salesman Problem can be arrived at by applying the solution strategy for Minimal Spanning Tree problem with an example. **(16)**

12. (a) Devise a parallel algorithm that could be deployed on a CREW PRAM model to find the maximum among N keys using Tournament method. Illustrate how the algorithm works over the input instance <12,10,5,15,18,20,4,6> with four processors. **(16)**

(OR)

(b) Illustrate the different types of parallel architectures with diagrams. **(16)**