Roll No..

MCTA-102

M.E./M.Tech., I Semester Examination, June 2020
Programming System

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) What do you understand by the terms 'Program' and 'Programming language'? How program is different from Algorithm and Pseudocode?   6

    b) Define Data Structures. Comment on the use of data structures.   4

    c) List different types of data structures. Write few lines for each.   4

2. a) Discuss in detail about the Stack. How stack can be used for solving arithmetic expressions? Explain.   5

    b) Explain the method for conversion of In-fix expression to Pre-fix and Post-fix expressions, with a suitable example.   5

    c) What is Hashing? What is this used for ? Explain by enlisting some popular hash functions. 4

3   a) Define Tree data structure. What is specific about Binary tree? How can searching be done using Binary tree structure?   6

    b) List the tree traversal algorithms. Write a differentiating notes on these.   5

    c) What is serious about Algorithms? Does there exists only one algorithm for any problem? 3

4. a) Explain in detail the Heap sort algorithm.   5

    b) How can algorithm affect the net time of execution/computation? Explain with suitable example.   4

    c) What do we mean by 'Asymptotic Time'? Why aren't we doing algorithm analysis on Actual Time of execution? Explain.   5

5. a) Explain the three asymptotic time complexity notations in detail. Also comment on average case and worst case complexities.   7

    b) Explain divide and conquer approach for problem solving, by considering a proper problem.7

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6. a) Which type of the problems are best solvable using Dynamic programming approach? List some of the practical problems of that type. 4

   b) How to solve Recurrence Function's used to represent time complexity of an algorithm? Write short on each of these methods. 7

   c) Solve the below given recurrence function using any method. 3

$$s(n) = \begin{cases} 0 & n = 0 \\ n + s(n-1) & n > 0 \end{cases}$$

7. a) Write algorithm for insertion Sort. Iterate the whole algorithm on suitable list as an example. Derive the time complexity expression for the same algorithm. 9

   b) Discuss any one problem relating to string processing. Also write algorithm for this problem. 5

8. a) Give a detailed differentiating note on P Class, NP Class, NP-hard and NP-complete class problems. 8

   b) List some popular NP complete problems. Also write few lines about each. 4

   c) Write the category to which these problems belongs to separately: 2

   Travelling Salesman problem, N Queens problem, Knapsack problem, Subset Sum problem, Vertex Cover problem.

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