



(Pages : 2)

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Reg. No. :

Name :

**Seventh Semester B.Tech. Degree Examination, November 2015
(2008 Scheme)**

08.702 DESIGN AND ANALYSIS OF ALGORITHMS (R)

Time : 3 Hours

Max. Marks : 100



PART - A

Answer **all** questions. **Each** question carries **4** marks.

1. Explain the significance of using order notations in analysis of algorithms.
2. Show that the recurrence $T(n) = T(n - 1) + 1$ is asymptotically bound by $\theta(n)$.
3. Is an array that is in sorted order, a min-heap ? Justify.
4. What value of 'q' does the partition algorithm return when all elements in the array $A[p..r]$ have the same value ?
5. Given an adjacency list representation of a directed graph, how long does it take to compute the out degree of every vertex ? How long does it take to compute the indegrees ?
6. What is a minimum spanning tree ? Which data structure is used by Prim's algorithm to find the MST ?
7. Explain the properties of a red black tree.
8. What are polynomial time computable algorithms ?
9. What are the characteristic properties possessed by problems solved using greedy technique ?
10. Explain branch and bound technique of problem solving. **(10x4=40 Marks)**

P.T.O.



PART – B

Answer **one** question from **each** Module. **All** questions carry **equal** marks.

MODULE – I

11. a) Draw the recursion tree for $T(n) = 4T\left(\lfloor \frac{n}{2} \rfloor\right) + c_n$ where c is a constant and provide a tight asymptotic bound on its solution. 10
- b) Use iteration to solve $T(n) = T(n - a) + T(a) + n$ where $a \geq 1$ is a constant. 10

OR

12. a) Illustrate the operation of Max-heapify $(A, 3)$ on $A = \langle 27, 17, 3, 16, 13, 10, 1, 5, 7, 12, 4, 8, 9, 0 \rangle$. 7
- b) Illustrate the operation of Quicksort on the array $A = \langle 5, 13, 2, 25, 7, 17, 20, 8, 4 \rangle$. 13

MODULE – II

13. a) Show the results of inserting the keys F, S, Q, K, C, L, H, T, V, W, M, R, N, P in order into an empty B-Tree. 10
- b) Explain Dijkstra's algorithm to find the shortest path with the help of an example. 10

OR

14. a) Discuss about the different cases to be considered for a red black tree insertion. 10
- b) Illustrate DFS algorithm on a complete graph with an example. 10

MODULE – III

15. a) Solve TSP on 5 cities by branch and bound. 15
- b) Discuss about the characteristics of dynamic programming. 5

OR

16. a) Show how the following matrices would be multiplied using Strassen's algorithm 10
- $$A = \begin{bmatrix} 7 & 9 \\ 2 & 5 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 2 \\ 6 & 5 \end{bmatrix}$$
- b) Discuss greedy approach to solve fractional knapsack problem. 10