(Pages : 2) **1916**

Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, May 2014
(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. Define time complexity and space complexity of an algorithm.
2. Show that the recurrence $T(n) = 2T\left(\left\lfloor n/2 \right\rfloor\right) + cn$ is asymptotically bound by $\Omega(n \log n)$.
3. Explain how will you implement priority queue using heap data structure.
4. Show that the running time of quickesort is $\theta(n^2)$ when the array is sorted in descending order.
5. What are disjoint-set data structures ? What are the different operations supported by them ?
6. Explain the technique of relaxation.
7. Define strongly connected components of a graph.
8. How does dynamic programming differ from greedy techniques ?
9. Discuss the relationship between NP, NP-complete and NP-hand problems.
10. Explain integer multiplication problem. **(10×4=40 Marks)**

PART – B

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

Module – I

11. a) Use a recursion tree to determine a good asymptotic upper bound on the recurrence $T(n) = 3T\left(\left\lfloor \frac{n}{2} \right\rfloor\right) + n$. Use substitution method to verify your answer. 10

b) Illustrate the operation of heapsort on the array
$A = \langle 5, 13, 2, 25, 7, 17, 20, 8, 4 \rangle$. 10

OR

12. a) Solve $T(n) = TT(n/2) + n^2$. 5

b) Solve $T(n) = TT(n/3) + n^2$. 5

c) Illustrate randomized quick sort with the help of an example. 10

Module – II

13. a) Explain Kruskal's algorithm to obtain a minimum spanning tree with the help of an example. 10

b) Write an algorithm to print the nodes of a directed acyclic graph in reverse topological order. 10

OR

14. a) Show the red black tree that result after successively inserting the keys 41, 38, 31, 12, 19, 8, 15, 4, 54 into an initially empty red black tree. Then delete the nodes 8, 31 and 19. 15

b) Analyse the complexity of breadth first search graph traversal algorithm. 5

Module – III

15. a) Consider the Knapserck instance
$n = 3$ $(W_1, W_2, W_3) = (2, 3, 4)$, $(P_1, P_2, P_3) = (1, 2, 5)$ $m = 5$.
Find the optimal solution. 10

b) Solve 5-Queens problem using backtracking. 10

OR

16. a) Find the optimal paranthesization of a matrix chain product whose sequence of dimension is $\langle 5, 10, 3, 12, 5, 50, 6 \rangle$. 15

b) Explain divide and conquer problem solving strategy. 5