Code: 15A05604 **R15**

B.Tech III Year II Semester (R15) Regular Examinations May/June 2018

DESIGN & ANALYSIS OF ALGORITHMS

(Computer Science & Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Show that $5n^2 - 6n = \Theta(n^2)$ are correct.
(b) Write an algorithm using recursive function to find sum of n numbers.
(c) State efficiency of Prim's algorithm and Dijkstra algorithm.
(d) What is knapsack problem?
(e) What is binary search tree?
(f) What is Hamiltonian problem?
(g) List out the applications of branch and bound.
(h) Draw the decision tree for comparison of three values.
(i) What is class P and NP?
(j) An NP problem can be solved in deterministic polynomial time, how?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Briefly explain the time complexity and space complexity estimation.
(b) Write the linear search and analyze its time complexity.

OR

3 (a) Write the Quick sort algorithm.
(b) Show that Quick sort's best-case running time is $\Omega(n \log n)$.

UNIT – II

4 (a) Explain the general Greedy method with an algorithm.
(b) Solve job sequencing with deadlines using the above technique with your own example.

OR

5 Find an optimal solution to the knapsack instance n = 7 objects and the capacity of knapsack m = 15. The profits and weights of the objects are $(P1, P2, P3, P4, P5, P6, P7) = (10, 5, 15, 7, 6, 18, 3)$ $(W1, W2, W3, W4, W5, W6, W7) = (2, 3, 5, 7, 1, 4, 1)$

UNIT – III

6 (a) Explain the general method of backtracking. Illustrate the backtracking method for solving eight queens problems.
(b) Using the above technique, find all possible sum of subsets for 3 items {1, 2, 3} where the total sum of subsets is '6'.

OR

7 (a) Write the algorithm for finding the strongly connected components in a digraph.
(b) Explain the components of Bi-connected components.

UNIT – IV

8 (a) Compare FIFOBB and LIFOBB for the branch and bound technique.
(b) Apply the branch-and-bound technique in solving the traveling salesman problem.

OR

9 Show that:
(i) $M(n) = O(I_t(n))$
(ii) $I_t(n) = O(M(n))$ where M(n) is the time complexity of multiplying two matrices and $I_t(n)$ be the time complexity of inverting a lower triangular matrix.

UNIT – V

10 (a) Show that the Hamiltonian path problem in NP-complete.
(b) Is travelling salesman problem is NP-complete or NP-hard. Justify your answer.

OR

11 (a) Discuss about Cook's theorem.
(b) Write about vertex cover and set cover in detail.

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