Hall Ticket Number:

Code No. : 14206 O2

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CSE) II Year II-Semester Old Examinations, May-2018

Design and Analysis of Algorithms

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 ×2 = 20 Marks)

1. Define Θ notation. What is the significance of it?
2. Determine if the following assertions are true or false.
   a) $n(n+1)/2 \in \Theta(n^2)$ b) $n^2(n+1)/2 \in \Omega(n^2)$
3. Write best case recurrence for quick sort and solve for time complexity.
4. Using optimal merge patterns find minimum number of record merges for files with records (f1,f2,f3,f4)=(5,2,10,6).
5. What is the Traveling Salesman Problem?
6. Determine an Longest Common Subsequence of <1,0,0,1,0,1,0,1> and <0,1,0,1,1, 0, 1, 1, 0>.
7. Draw one possible solution of 4-Queen problem.
8. What is the difference between Backtracking and Branch and Bound Technique?
9. Differentiate NP-Hard and NP-Complete.
10. State the Cook's Theorem.

Part-B (5 × 10=50 Marks)

11. a) What is the significance of worst case analysis of an algorithm? [5]
    b) Construct Binary max heap for the given elements (2,6,3,5,8,10,14,7), and then sort the elements using heapsort. [5]

12. a) Explain Merge Sort Algorithm with example. [5]
    b) Apply Kruskal's algorithm to construct the Minimum cost Spanning Tree on the graph shown in Figure 1. [5]

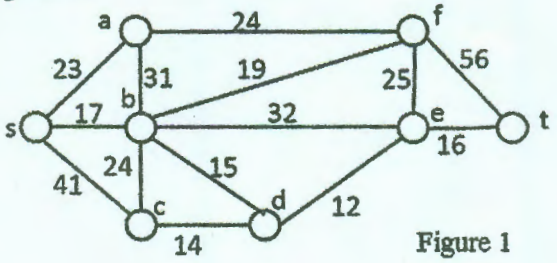

Figure 1

13. a) Explain the Dynamic programming algorithm for Matrix-Chain Multiplication problem. [6]
    b) Solve the Multistage graph to find shortest path from source node s to target node t using forward approach of Dynamic Programming for the graph given in Figure 2. [4]

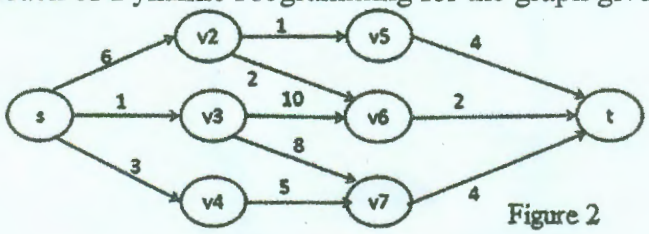

Figure 2

Contd... 2

14. a) Design the backtracking algorithm for 8-Queen problem. [5]

    b) Solve the 0/1 knapsack problem using branch and bound technique where there are 4 items with weights{3, 5, 9, 5}, profits{45, 30, 45, 10}and capacity(m) of the knapsack is 16. [5]

15. a) Write a non-deterministic sorting algorithm and analyze time complexity . [5]

    b) Prove that the Clique decision problem is NP-complete. [5]

16. a) Explain the amortized analysis methods with suitable examples. [5]

    b) Give asymptotic bounds for T(n) where $T(n) = 2T(n/4) + 2$. Assume T(n) is constant for $n \leq 2$. Use Masters Theorem. [5]

17. Answer any ***two*** of the following:

    a) Design all-pairs shortest paths algorithm. [5]

    b) Give a backtracking based solution to find Hamiltonian Cycle in a graph G (V,E). [5]

    c) Prove that if a problem A is polynomial time reducible to problem B and $B \in P$, then $A \in P$. [5]