Hall Ticket Number:

Code No. : 14605

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (IT: CBCS) IV-Semester Main Examinations, May-2018

Design & Analysis of Algorithms

Time: 3 hours Max. Marks: 70

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

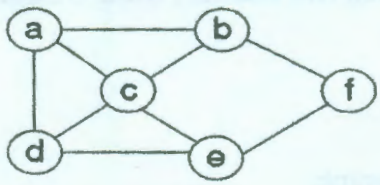
Part-A (10 × 2 = 20 Marks)

1. What are different notations used for algorithm analysis? Give examples for each with the help of graph.
2. Determine the frequency counts for all statements in the following algorithm and calculate its space and time complexity.

```
Algorithm Mult(a,b,c,n)
{
  for i:=1 to n do
   for j:=1 to n do
   {
     c[i,j]:=0;
     for k:=1 to n do

   c[i,j]:=c[i,j]+a[i,k]*b[k,j]
   ;
   }
```

3. Show how the quick sort algorithm sorts the following numbers 5,8,6,3,7,2
4. What is Knapsack Problem?
5. Distinguish between Dynamic programming and Greedy approach.
6. What is travelling sales person problem and what are its applications.
7. Draw the state space tree for Hamiltonian cycle for the given graph and identify Live node, E-node, Dead node.



8. List the Explicit and Implicit constraints for n-queens problem. Give one solution for 8-queens problem.
9. Can a non-deterministic algorithm be made as deterministic algorithm? Is yes how?
10. Write the Non deterministic algorithm for sorting.

Part-B (5 × 10 = 50 Marks)

11. a) State the Masters theorem for all the cases and apply it to find the time complexity for the given recurrence equations. [7]

    i) $T(n) = 8T(n/2) + n\log n$

    ii) $T(n) = T(n/4) + \log n$

    iii) $T(n) = 2T(n/2) + cn$

    b) Write about Amortized complexity. [3]

Contd... 2

12. a) What is Greedy Method? Give the control abstraction. [3]

    b) Given an array of jobs where every job has a deadline and associated profit if the job is finished before the deadline. It is also given that every job takes single unit of time, so the minimum possible deadline for any job is 1. How to maximize the total profit if only one job can be scheduled at a time. [7]

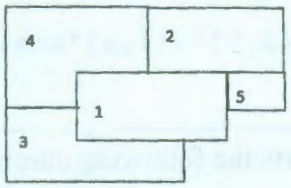
Job Id	1	2	3	4	5	6	7
Profit	3	5	20	18	1	6	30
Deadline	1	3	4	3	2	1	2

13. a) Give the formula for calculating the minimum cost for optimal binary search tree. [2]

    b) Use Optimal Binary Search Trees (**OBST**) to compute w(i,j), r(i,j) and c(i,j),0<=i<j<=4, for the identifiers set(a1, a2, a3, a4) = (do, if, int, while) with p(1:4)=(3, 3, 1, 1) and q(0:4)=(2, 3, 1, 1, 1). [8]

14. a) Explain the graph coloring problem and write an algorithm solution using Backtracking. [8]

    b) Reduce the following map to a graph, as an input for graph coloring problem. [2]



15. a) Explain the strategy to prove that a problem is NP-Hard. [4]

    b) Prove that Node cover decision problem is NP Complete. [6]

16. a) Write an algorithm for selection sort and calculate its time and space complexity. [5]

    b) Find Matrix Multiplication for given two matrices using Strassen's Matrix. [5]

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

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

    a) Explain algorithm for multistage graph. [5]

    b) Consider the travelling salesman instance defined by the cost matrix given below. Obtain the reduced cost matrix and find the optimal path using state space tree. [5]

∞	3	2	7
4	∞	3	6
1	1	∞	3
1	6	6	∞

    c) Define Classes P, NP, NP-Hard, NP-complete problems. Give the relationship among them. Differentiate between NP-Hard and NP-complete. [5]