Hall Ticket Number:

Code No. : 14206

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

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

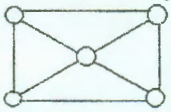
Design and analysis of Algorithms

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. Determine if the following assertions are true or false.
   a) $n^2(n+1)/2 \in \Theta(n^3)$ b) $n(n+1)/2 \in \Omega(n)$
2. Derive the time and space complexity of matrix multiplication.
3. Write the control abstraction of greedy method.
4. Solve the recurrence relation T(n)=5T(n/4)+3n
5. What are bi-connected components? Give an example.
6. Define the Purging rule.
7. What is the use of bounding function?
8. Find the chromaticity of the given graph.

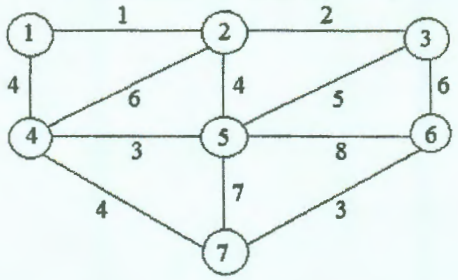


9. Compare P, NP, NP-Hard and NP-Complete classes.
10. What are the tractable and intractable problems?

Part-B (5 ×10 = 50 Marks)
(All sub-questions carry equal marks)

11. a) Explain Big-oh(O), Omega(Ω) and Theta(Θ) notations with suitable examples.
    b) Write an algorithm for sequential search and explain the worst, best and average case efficiencies.

12. a) Apply quicksort to sort the list *E, X, A, M, P, L, E* in alphabetical order. Draw the tree of the recursive calls made.
    b) Explain kruskal's algorithm for finding minimum spanning tree for the given graph.



13. a) Construct an optimal binary search tree for the following instance where n = 4
    A(1:4) = (CTS, DELL, INFOSYS, WIPRO)
    P(1:4) = (2,2,3,1)
    Q(0:4) = (2,3,1,1,1)
    b) Write an Algorithm to compute lengths of shortest paths using All-pair shortest path.

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14. a) Write an algorithm for N-Queens problem. Explain with 4-Queens problem.

    b) Find an optimal solution to the following 0/1 Knapsack problem by considering the instance weights $(w_1,w_2,w_3) = (2,3,4)$, profits $(p_1,p_2,p_3) = (11,12,15)$ and capacity $m = 6$ using Least cost branch and bound(LCBB) approach.

15. a) Explain CNF Satisfiability(SAT) with an example.

    b) Prove that the Clique decision problem is NP-Complete.

16. a) Write the recursive function for sum of n numbers and find its time and space complexities.

    b) Design greedy algorithm for optimal storage on tapes problem to assign programs.

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

    a) Design dynamic programming solution to the Longest Common Subsequence(LCS).

    b) Differentiate between backtracking and Branch & Bound design strategies.

    c) What are the Steps involved to prove the given problem is NP-Complete?