Question Paper Code : X20397

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020

Third/Fourth Semester

Computer Science and Engineering

CS 6402 – DESIGN AND ANALYSIS OF ALGORITHMS

(Common to : Information Technology)

(Regulations 2013)

Time : Three Hours   Maximum : 100 Marks

Answer ALL questions

PART – A   (10×2=20 Marks)

1. Give the Euclid's algorithm for computing gcd of two numbers.

2. What is a basic operation ?

3. Give the mathematical notation to determine if a convex direction is towards left or right and write the algorithm.

4. Prove that any comparison sort algorithm requires Ω (n log n) comparisons in the worst case.

5. State the general principle of greedy algorithm.

6. What is meant by dynamic programming ?

7. Define the iterative improvement technique.

8. What is maximum cardinality matching ?

9. How NP-Hard problems are different from NP-Complete ?

10. Define Hamiltonian Circuit problem.

PART – B **(5×13=65 Marks)**

11. a) i) Write the Insertion sort algorithm and estimate its running time. **(7)**

   ii) Find the closest asymptotic tight bound by solving the recurrence equation $T(n) = 8T(n/2) + n2$ with $(T(1)=1)$ using Recursion tree method. [Assume that $T(1) \in \Theta(1)$]. **(6)**

   (OR)

   b) i) Suppose W satisfies the following recurrence equation and base case (where c is a constant) : $W(n) = c.n + W(n/2)$ and $W(1) = 1$. What is the asymptotic order of $W(n)$? **(6)**

   ii) Show how to implement a stack using two queues. Analyze the running time of the stack operations. **(7)**

12. a) What is divide and conquer strategy and explain the binary search with suitable example problem. **(13)**

   (OR)

   b) Solve the following using Brute-Force algorithm : **(13)**

   Find whether the given string follows the specified pattern and return 0 or 1 accordingly.

   Examples :

    i) Pattern : "abba", input : "redblueredblue" should return 1

   ii) Pattern : "aaaa", input : "asdasdasdasd" should return 1

   iii) Pattern : "aabb" input : "xyzabcxzyabc" should return 0.

13. a) Give the Pseudo code for Prim's algorithm and apply the same to find the minimum spanning tree of the graph shown below :
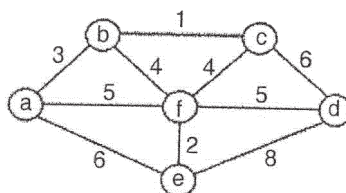
   (OR)

   b) Explain the memory function method for the Knapsack problem and give the algorithm.

14. a) i) State and prove Max-Flow Min-Cut theorem. **(7)**

    ii) Summarize the steps of the simplex method. **(6)**

(OR)

  b) i) Explain briefly about Stable marriage algorithm. **(7)**

    ii) Determine the time-efficiency class of the stable marriage algorithm. **(6)**

15. a) i) Suggest an approximation algorithm for traveling salesperson problem. Assume that the cost function satisfies the triangle inequality. **(7)**

    ii) Explain how job assignment problem could be solved, given n tasks and n agents where each agent has a cost to complete each task, using Branch and Bound technique. **(6)**

(OR)

  b) i) The knight is placed on the first block of an empty board and moving according to the rules of chess, must visit each square exactly once. Solve the above problem using backtracking procedure. **(7)**

    ii) Implement an algorithm for Knapsack problem using NP-Hard approach. **(6)**

PART – C   **(1×15=15 Marks)**

16. a) Apply the greedy technique to find the minimum spaning tree using Prim's algorithm for the given graph. **(15)**
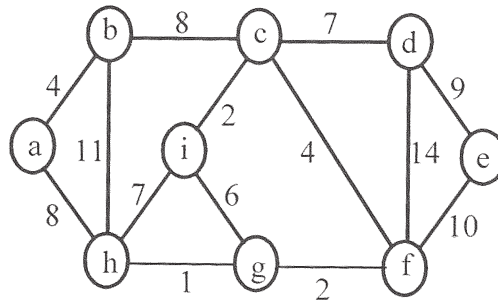
(OR)

  b) Explain the 4-Queen's problem using backtracking. Write the algorithms. Give the estimated cost for all possible solutions of 4-Queen's problem. Specify the implicit and explicit constraints. **(15)**

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