BCA (All) II () - IV (Main/Back) End Semester Examination, April 2024
BCACCA4102: Design and Analysis of Algorithm

Time: 3 Hours   **Total Marks:** 60   **Min. Passing Marks:** 21/24/27   **Question Paper ID:** 000724

Instructions: Attempt all five questions. There is an internal choice either (a or b) in Q1 to Q5. Marks of each question or its parts are indicated against each question/part. Draw neat sketches wherever necessary to illustrate the answer. Assume missing data suitably (if any) and clearly indicate the same in the answer.

Bloom Level(BL): 1-Remembering, 2-Understanding, 3-Applying, 4-Analysing, 5-Evaluating, 6-Creating

Use of following supporting material is permitted during examination for this subject: Nil

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Q1. (a) (i) Describe an Algorithm? Write and explain in brief all the fundamental steps required to design and analyse an algorithm. **(6 Marks)**

(ii) Find out the MST using Kruskal's Algorithm **(6 Marks)**

Marks	BL	CO
12	2	1
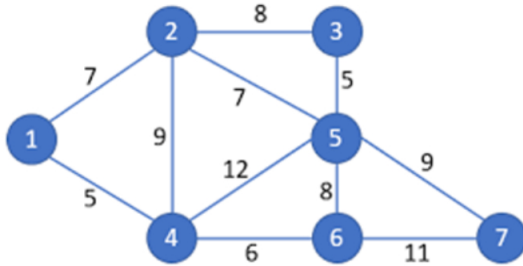
(OR)

(b) (i) What do you mean by space complexity? What factors are considered while calculating the space complexity? **(6 Marks)**

(ii) Robber went for robbery; he had one bag and wanted to fill it with maximum profits. Shop having following item along with their rates and weights .What is the optimum solution fill his bag with those items which gave him maximum profit. He may take fraction of any item.
Bag Capacity :20
Number of items:6
Weights (4, 10, 5, 6, 8,3)
Rates (20, 15, 30, 18, 16, 21) **(6 Marks)**

Q2. (a) (i) Discuss the scenario where we can use divide & conquer method? Sort the following sequence using merge sort method 85, 4, 23, 46, 12, 50, 35,18 . Draw recursive tree for same example. **(6 Marks)**

(ii) What do you mean by greedy approach? How is it different from divide and conquer? **(6 Marks)**

Marks	BL	CO
12	5	2

(OR)

(b) (i) Suppose a person need to find out optimum path between a source and destination vertex, help him to identify minimum spanning tree for the given graph using Prim's algorithm.(Source vertex:0) **(6 Marks)**
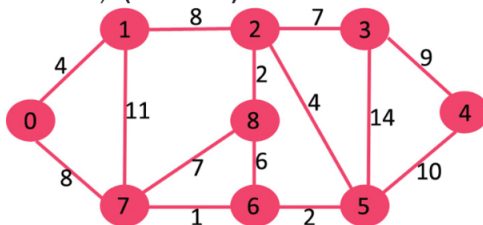
(ii) In coding completion students got questions where they need to solve a puzzle. Puzzle consists of 8 queens. Students need to arrange all 8 queen onto 8*8 matrix by using following constraints:
One queen in row.
No two queens in same column and also on same diagonal.
Provide solution. **(6 Marks)**

Q3. **(a)** (i) Find the longest common subsequence of ABCDBCDCDD and BCDCD using dynamic programming approach, showing all steps. **(6 Marks)**

                                                     Marks BL CO

                                                        12   5   3

(ii) Solve the following **0-1 Knapsack problem** using Branch and Bound method where no of objects= 5, m(Size of knapsack)= 7
(p1, p2…. p5) = (15, 12, 16, 8, 10) and (w1, w2…. w5) = (5, 3, 4, 1, 2) **(6 Marks)**

<div align="center">(OR)</div>

(b) (i) Difference Between Naïve string matching pattern and Knuth Morris Pratt algorithm, also explain how Both are different in terms of complexity. **(6 Marks)**
ii.) Amit wants to assign 4 jobs to four persons he require least cost assignment for the same, where the related costs are given in the following matrix: **(6 Marks)**

		1	2	3	4	
	a	14	4	9	7	
	b	9	13	6	5	
c=	c	7	6	3	11	
	d	2	4	6	10	

Q4. **(a)** (i) What do you mean by "pattern matching" and how do you distinguish between the Boyer Moore, Robin Karp, KMP, and naive algorithms? **(6 Marks)**

                                                    Marks BL CO

                                                        12   1   4

(ii) Using Robin Karp algorithm find whether the pattern P is in Text T exist or not
Text T = 88okay56hf
Pattern P= ok
Available Character's=10
[ASCII Value for a is 65
          1 is 49]
Hash Function= Key mod 10
Write solution step by step. **(6 Marks)**

<div align="center">(OR)</div>

(b) (i) Randomize quick sort improve the worst case time complexity of deterministic quick sort, what will be the running time randomize quick sort.(In worst case scenario) **(6 Marks)**

(ii) Define 2-SAT problem with a suitable example? **(6 Marks)**

Q5. **(a)** (i) Define the terms P, NP, NP Complete and NP hard problems. Also give relationship between each of the class? **(6 Marks)**

                                                    Marks BL CO

                                                        12   1   5

(ii) Explain Set-cover problem and Vertex-cover problem? **(6 Marks)**

<div align="center">(OR)</div>

(b) (i) Define deterministic and non-deterministic algorithm with suitable example? **(6 Marks)**
(ii) Explain the need for Approximation algorithms and how they can be used for NP hard problems. **(6 Marks)**

<div align="center">***End of Question Paper***</div>