**Velagapudi Ramakrishna Siddhartha Engineering College::Vijayawada**

**(Autonomous)**

**VR20**

II /IV B Tech Degree Examinations(February/2022)

Fourth Semester

**Department of Information Technology**

**20IT4303:ADVANCED DATA STRUCTURES AND ALGORITHMS**

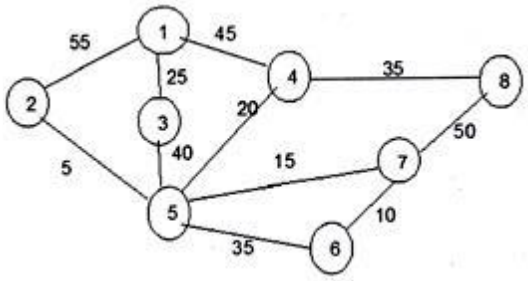
| Time: 3Hrs | **MODEL QUESTION PAPER** | Max Marks:70 |
|---|---|---|

Part – A is Compulsory

Answer one (01) question from each unit of Part – B

Answers to any single question or its part shall be written at one place only

***Cognitive Levels(K): K1-Remember;K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create***

| Q. No | | Question | Marks | Course Outcome | Cog. Level |
|---|---|---|---|---|---|
| **Part - A** | | | | | **10X1=10M** |
| 1 | a | State the Properties of Red-Black Trees | 1 | CO1 | K1 |
| | b | Define Time and Space complexity. | 1 | CO1 | K1 |
| | c | What is time complexity of Quick sort in best, average and worst cases? | 1 | CO2 | K1 |
| | d | State Knapsack Problem. | 1 | CO3 | K1 |
| | e | Define principle of optimality. | 1 | CO3 | K1 |
| | f | Differentiate between divide-and-conquer and dynamic programming | 1 | CO2 | K2 |
| | g | Define E-node, live node and dead node | 1 | CO2 | K1 |
| | h | State graph coloring problem | 1 | CO2 | K1 |
| | I | Differentiate between LC-branch-and-bound and FIFO branch-and-bound | 1 | CO3 | K2 |
| | j | Differentiate between P and NP problems | 1 | CO4 | K2 |
| **Part - B** | | | | | **4X15 =60M** |
| | | **UNIT - I** | | | |
| 2 | a | Explain top down insertion and deletion in Red-Black Trees with suitable examples. | 8 | CO1 | K3 |
| | b | Write about linear time construction of suffix arrays and suffix trees. | 7 | CO1 | K2 |
| | | **(OR)** | | | |
| 3 | a | Define algorithm and discuss the criteria an algorithm must satisfy? Describe asymptotic notations in detail with suitable examples. | 9 | CO1 | K2 |
| | b | Write an algorithm to find maximum and minimum elements of an array. Evaluate its time complexity. | 6 | CO1 | K3 |
| | | **UNIT - II** | | | |
| 4 | a | State the control abstraction for Divide and Conquer technique. | 5 | CO2 | K2 |
| | b | Sort the elements (12, 67, 33, 10, 9, 72, 45, 11) using quick sort and derive its time complexity in average case. | 10 | CO2 | K3 |
| | | **(OR)** | | | |
| 5 | a | Explain about Job sequencing with deadlines problem with an example. | 7 | CO3 | K2 |
| | b | Define Minimum cost spanning tree. Apply Kruskals algorithm on the following example to find minimum cost spanning tree.   | 8 | CO3 | K3 |
| | | **UNIT - III** | | | |
| 6 | a | State All-Pairs Shortest Path problem and Explain how it is solved | 7 | CO3 | K2 |

<table>
<tr><td></td><td></td><td>with an example using dynamic programming.</td><td></td><td></td><td></td></tr>
<tr><td></td><td>b</td><td>Describe 0/1 knapsack problem Find an optimal solution for 0/1 knapsack problem using dynamic programming where<br>n = 5, m = 12 (p1, p2, p3, p4, p5) = (4, 8, 6, 7, 9) and<br>(w1, w2, w3, w4, w5) = (2, 3, 1, 4, 1)</td><td>8</td><td>CO3</td><td>K3</td></tr>
<tr><td colspan="6">(OR)</td></tr>
<tr><td>7</td><td>a</td><td>Compare and Contrast back tracking and branch & bound design techniques.</td><td>6</td><td>CO2</td><td>K2</td></tr>
<tr><td></td><td>b</td><td>State n queen’s problem. Solve the 4-Queens problem using backtracking. Also mention the algorithm steps in solving the problem with time complexity.</td><td>9</td><td>CO2</td><td>K3</td></tr>
<tr><td colspan="6">UNIT - IV</td></tr>
<tr><td>8</td><td>a</td><td>Write the control abstraction of LC search.</td><td>5</td><td>CO3</td><td>K2</td></tr>
<tr><td></td><td>b</td><td>Apply LCBB to solve the following Travelling salesman problem (TSP). Represent each stage of computation using state space tree. Here 1, 2, 3, 4, 5 represents different cities and each cell value is the distance between corresponding two cities.
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr>
<tr><td>1</td><td>∞</td><td>20</td><td>30</td><td>10</td><td>11</td></tr>
<tr><td>2</td><td>15</td><td>∞</td><td>16</td><td>4</td><td>2</td></tr>
<tr><td>3</td><td>3</td><td>5</td><td>∞</td><td>2</td><td>4</td></tr>
<tr><td>4</td><td>19</td><td>6</td><td>18</td><td>∞</td><td>3</td></tr>
<tr><td>5</td><td>16</td><td>4</td><td>7</td><td>16</td><td>∞</td></tr>
</table></td><td>10</td><td>CO3</td><td>K3</td></tr>
<tr><td colspan="6">(OR)</td></tr>
<tr><td>9</td><td>a</td><td>Illustrate deterministic and non-deterministic algorithms with examples</td><td>8</td><td>CO4</td><td>K2</td></tr>
<tr><td></td><td>b</td><td>Explain about P, NP, NP-Hard and NP-Complete.</td><td>7</td><td>CO4</td><td>K2</td></tr>
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**VELAGAPUDI RAMAKRISHNA**

# SIDDHARTHA ENGINEERING COLLEGE::VIJAYAWADA

**(AUTONOMOUS)**

Dt.12-06-2019

## GUIDELINES FOR FRAMING MODEL QUESTION PAPER

The model papers for all subjects in a semester are gathered from the departments whenever a course is offered for the first time adopting new regulation. All the Heads of the Departments are requested to direct their faculty to strictly adhere to the following guidelines while framing the model question papers for the subjects of UG and PG courses in the new curriculum.

1. Questions must be covered unit-wise uniformly as per the syllabus without missing the competency.

2. The question paper shall reflect the ***Bloom's Cognitive Levels of Learning***.

   **Cognitive Levels (K): K1-Remember; K2-Understand; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create**

   - The composition of question paper shall have questions at different complexity levels as listed below:
     - Questions that can be attempted by an average student (K1 & K2) 40%
     - Questions of intermediate complexity (K3 & K4) 40-50%
     - Questions of design and application oriented nature (K5 & K6) 10-20%

3. Question paper is to be set conforming to the OBE pattern clearly mentioning the Course Outcomes and Bloom's Cognitive Levels against each question.

4. The questions are to be set with minimum 2 sub-questions (a) & (b) for each main question to the extent possible covering entire syllabus in the unit.

5. Specify the marks against each question / part of a question in Part B.

6. The figures, if any, may be computer aided or neatly drawn with black pen indicating clearly the values/dimensions.

7. Prepare the one mark questions in only sentence form. Answers to these questions must be unique and having short answers limited to three/four lines.

**PRINCIPAL**