

**K. J. Somaiya Institute of Technology, Sion, Mumbai-22**  
(Autonomous College Affiliated to University of Mumbai)

April – May 2023

B.Tech Program: **Artificial Intelligence & Data Science** Scheme-II

Examination: SY Semester: IV

Course Code: **AIC402** and Course Name: **Analysis of Algorithm**

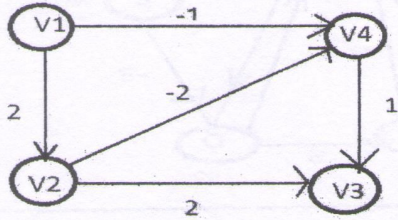
Date of Exam: 16/05/2023

Duration: 2.5 Hours

Max. Marks: 60

**Instructions:**

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

		Max. Marks	CO	BT level
<b>Q 1</b>	<b>Solve any six questions out of eight.</b>	<b>12</b>		
<b>i)</b>	List characteristic components of Dynamic Programming.	2	CO4	R
<b>ii)</b>	List properties of Asymptotic Notations.	2	CO1	R
<b>iii)</b>	What is the time complexity of merge sort algorithm in the worst case?	2	CO2	U
<b>iv)</b>	What is a minimum spanning tree?	2	CO3	U
<b>v)</b>	What is the difference between the Breadth-First search and Depth-First search algorithms?	2	CO2	U
<b>vi)</b>	What are the advantages and disadvantages of using back tracking in algorithm design?	2	CO5	U
<b>vii)</b>	List String matching algorithm.	2	CO6	R
<b>viii)</b>	What is Graph colouring?	2	CO5	U
<b>Q.2</b>	<b>Solve any four questions out of six.</b>	<b>16</b>		
<b>i)</b>	Find the shortest path from the source vertex 'V1' to all other vertices in the graph given below. Also, check for the negative weight cycles.  <div style="text-align: center;">  <pre> graph TD     V1((V1)) -- 2 --&gt; V2((V2))     V1 -- -1 --&gt; V4((V4))     V2 -- 2 --&gt; V3((V3))     V2 -- -2 --&gt; V4     V3 -- 1 --&gt; V4                 </pre> </div>	4	CO4	An

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<b>ii)</b>	Discuss about Rabin Karp String Matching algorithm.	<b>4</b>	<b>CO6</b>	U
<b>iii)</b>	Write an algorithm for Insertion sort with its time complexity.	<b>4</b>	<b>CO1</b>	U
<b>iv)</b>	Discuss about Travelling Salesman problem.	<b>4</b>	<b>CO5</b>	U
<b>v)</b>	Trace Quicksort for the data set: $A = \{310, 285, 179, 652, 351, 423, 520, 245, 456\}$	<b>4</b>	<b>CO2</b>	Ap
<b>vi)</b>	Find MST with Kruskal's algorithm.	<b>4</b>	<b>CO3</b>	Ap
<b>Q.3</b>	<b>Solve any two questions out of three.</b>	<b>16</b>		
<b>i)</b>	Discuss in detail Selection Sort and solve $A = \{11, 7, 17, 3, 9, 29, 85, 9, 25, 54\}$ .	<b>8</b>	<b>CO1</b>	Ap
<b>ii)</b>	Solve the 8-Queens problem with state space tree for the same.	<b>8</b>	<b>CO5</b>	Ap
<b>iii)</b>	Solve the shortest path from source 'A' for the following graph using Bellman-Ford Algorithm.	<b>8</b>	<b>CO4</b>	Ap

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<b>Q.4</b>	<b>Solve any two questions out of three.</b>	<b>16</b>																	
<b>i)</b>	Sort given elements using merge sort: {50, 31, 71, 38, 12, 33, 5, 710, 55, 100}	<b>8</b>	<b>CO2</b>	Ap															
<b>ii)</b>	Solve the following knapsack problem using dynamic programming where N = 4 and Capacity is M = 9.  <table border="1" data-bbox="539 654 960 1013"> <thead> <tr> <th>Item (i)</th> <th>Value (vi)</th> <th>Weight (wi)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>18</td> <td>3</td> </tr> <tr> <td>2</td> <td>25</td> <td>5</td> </tr> <tr> <td>3</td> <td>27</td> <td>4</td> </tr> <tr> <td>4</td> <td>10</td> <td>3</td> </tr> </tbody> </table>	Item (i)	Value (vi)	Weight (wi)	1	18	3	2	25	5	3	27	4	4	10	3	<b>8</b>	<b>CO3</b>	Ap
Item (i)	Value (vi)	Weight (wi)																	
1	18	3																	
2	25	5																	
3	27	4																	
4	10	3																	
<b>iii)</b>	Apply KMP Algorithm for the following string: T = a b c a b a b a b c b c a b where P = b a b a b c b	<b>8</b>	<b>CO6</b>	Ap															

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