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

May-June 2025
B. Tech Program: Computer Engineering Scheme I/II/IIB/III:_III_
Regular: SY Semester: IV
Course Code: CEC402 and Course Name: Analysis of Algorithms
Date of Exam: 21/05/2025 Duration: 02.5 Hours Max. Marks: 60

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

| Q. No. | Question | Max. Marks | CO | BT level |
|---|---|---|---|---|
| Q 1 | Solve any **two** questions out of three: (05 marks each) | 10 | | |
| a) | Solve the following recurrence relation using masters method<br>i) $T(n) = 7T(n/2)+18\ n^2$<br>ii) $T(n) = 9T(n/3) +4n^6$ | | CO1 | Ap |
| b) | Apply quick sort to sort the list {E,X,A,M,P,L,E} by using divide and conquer approach using pivot as first element | | CO2 | Ap |
| c) | Compare Minimum Cost Spanning Tree Prim's and Kruskal's Algorithm (05 Points) | | CO3 | U |
| Q 2 | Solve any **two** questions out of three: (05 marks each) | 10 | | |
| a) | Write an algorithm for selection sort and derive its complexity | | CO1 | U |
| b) | Explain how backtracking approach is applied in graph coloring problem | | CO5 | U |
| c) | Determine how many valid hits the Rabin-Karp string matcher encounters in the text T = "aaaaab" when looking for the pattern P = "aab" with modulo q=13. | | CO6 | Ap |
| Q.3 | Solve any **two** questions out of three. (10 marks each) | 20 | | |
| a) | Write an algorithm for Quicksort and analyze it with respect to the worst, best and average-case. | | CO2 | U |
| b) | Solve the following instance of assembly line scheduling using dynamic programming approach<br>**Processing Time/Assembling Time**<br>$P_{i,j}$: 1: 7 9 3 4 8 4; 2: 8 5 6 4 5 7<br>**Transferring time**<br>$t_{i,j}$: 1: 2 3 1 3 4; 2: 2 1 2 2 1<br>**Entry Time**<br>$e_i$: 1: 2; 2: 4<br>**Exit Time**<br>$x_i$: 1: 3; 2: 2 | | CO4 | Ap |
| c) | Using Dijkstra's shortest path algorithm, determine shortest path from vertex 1 for the following graph. | | CO3 | Ap |



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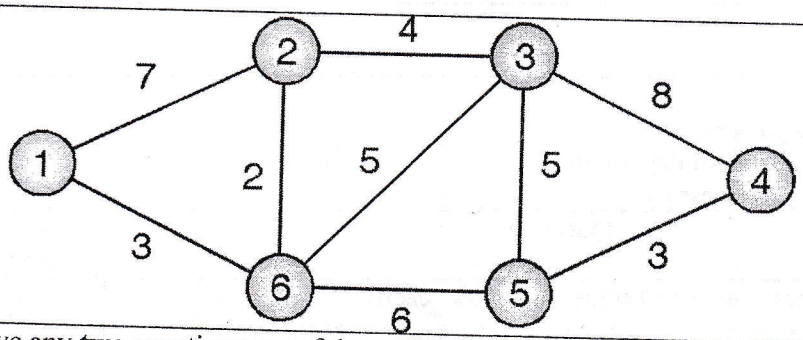
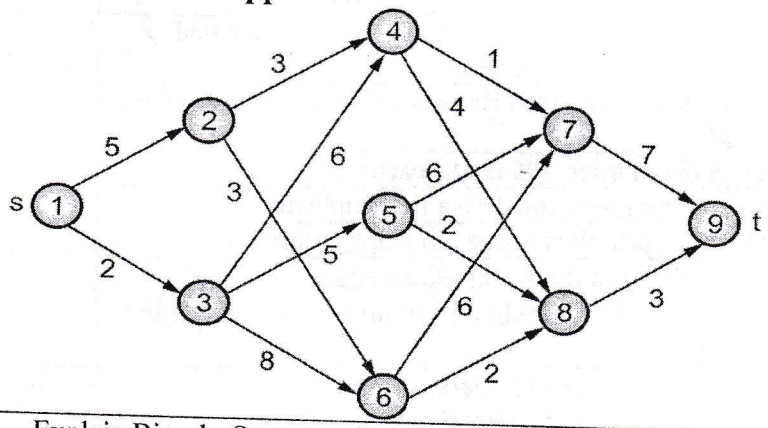



| | | | | |
|---|---|---|---|---|
| Q.4 | Solve any **two** questions out of three. (10 marks each) | 20 | | |
| a) | Find the minimum cost path from s to t in the following multistage graph using **forward approach**   | | CO4 | Ap |
| b) | (i) Explain Big-oh, Omega and Theta Notations with the help of Graph. (05M)<br>(ii) And represent the following function using above notations. (05M)<br>a. $T(n) = 3n + 2$<br>b. $T(n) = 10n^2 + 2n + 1$ | | CO1 | Ap |
| c) | Solve the following sum of subset problem using backtracking: n = 7, required sum = 15, weights = [2,3,5,6,7,8,9] | | CO5 | Ap |

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