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Mid semester Examination (Summer 2021-2022),

Department of Computer Science & Engineering, IIT (ISM), Dhanbad

Discipline: M.Tech. (CSE) & R.S.

Subject: ^{AGT} Data Mining (CSC503)

Time: 2 hours, Marks: 50

Instructions: Answer all questions

Q. No		Marks
1	a. ☒ Prove that Peterson Graph is non-planar using Kuratowski's Theorem. b. ☒ Prove that Peterson Graph is non-planar using Wagner's Theorem. c. ☐ Prove that every planar graph has a dual.	4 4 2
2	a. ☒ If a graph G is maximal planar graph with n vertices ($n \geq 3$) and m edges then show that $m = 3n - 6$. b. ☒ Describe a method for finding a minimum connected dominating set and also illustrate the same with suitable example.	4 3+3
3	a. ☒ For a planar graph G with n number of vertices and e number of edges with r regions, prove by method of induction that $n - e + r = 2$. b. ☒ Illustrate with suitable example (considering a labelled tree T with at least 9 vertices) and converting T into its equivalent Prufer Sequence S and vice versa.	4 (3+3)
4	starting vertex --	P. T. O

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	a. Given a graph and a source vertex in the graph, find the shortest paths from the source vertex (A) to all other vertices in the above graph using Dijkstra's Shortest Path Algorithm. b. Illustrate the situation when Dijkstra's Algorithm may fail to find the shortest path but Bellman-Ford Algorithm may succeed. And also mention the situation when Bellman-Ford Algorithm may fail (illustrate with an example).	5 (3+2)
5	a. Find the all pairs shortest paths among all vertices for the following graph using Floyd-Warshall Algorithm (showing all intermediate steps) <pre> graph TD 1((1)) -- 4 --> 2((2)) 2 -- -2 --> 1 1 -- 3 --> 3((3)) 3 -- -1 --> 1 3 -- 2 --> 4((4)) 4 -- -1 --> 3 </pre> b. Describe Floyd-Warshall Algorithm to find the shortest paths among all vertices.	5 5

End