PRESIDENCY UNIVERSITY
BENGALURU

Department of Research & Development
Mid - Term Examinations - SEPTEMBER 2024

Odd Semester: Ph.D. Course Work	**Date**: 27/09/2024
Course Code: MAT818	**Time**: 10:00am – 11:30am
Course Name: Coloring and Matrices in graphs	**Max Marks**: 50
Department: Mathematics	**Weightage**: 25%

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

	Answer ALL the Questions. Each question carries 5 marks.	**4Qx5M=20M**
1	Prove that, a graph is bipartite if and only if all its cycles are even.	**5 Marks**
2	Prove that, for any graph G of order 6 or $\overline{G}$ Contains a triangle.	**5 Marks**
3	Show that, For any graph G, $k(G) \leq K^{'}(G) \leq \delta(G)$.	**5 Marks**
4	Prove that, if G is n-connected, $n \geq 2$ then its line graph $L(G)$ is also n-connected.	**5 Marks**

Part B

	Answer ALL Questions. Each question carries 15 marks.	**2QX15M=30M**
5	Show that the following statements are equivalent, 1. G is a tree 2. Every two nodes of G are joined by a unique path. 3. G is connected and p=q+1 4. G is acyclic and p=q+1 5. G is acyclic and if any two nonadjacent nodes of G are joined by an edge, then G+e has exactly one cycle.	**15 Marks**

6	Prove that, the minimum number of nodes separating two nonadjacent nodes s and t equals the maximum number of disjoint $s-t$ path.	**15 Marks**