Roll No.												

PRESIDENCY UNIVERSITY
BENGALURU

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

Odd Semester: Ph.D. Course Work	**Date**: 27 /09/2024
Course Code: MAT817	**Time**: 2:00pm – 3:30pm
Course Name: Distance 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 nontrivial graph G is radius minimal if and only if G is a tree.	**5 Marks**
2	Show that, the maximum trail number among all graphs on p nodes and q edges is, $\begin{cases} q & p\ odd \text{ or } q \le \binom{n}{2} - \frac{n}{2} + 1 \\ \binom{n}{2} - \frac{n}{2} + 1 & otherwise \end{cases}$	**5 Marks**
3	Prove that, a graph G is a geodetic if and only if for every node v, each node $u \in N_k(v)$ is adjacent to a unique node $N_{k-1}(v)$ for $2 \le k \le e(v)$.	**5 Marks**
4	Prove that, the center C(G) of any connected graph G lies within a Block of G.	**5 Marks**

Part B

Answer ALL Questions. Each question carries 15 marks.		**2QX15M=30M**
5	Show that, for each node v of a connected (p,q) –graph G, $p-1 \le s(v) \le \frac{(p-1)(p+2)}{2-q}$ and these bounds can be achieved for each q, $p-1 \le q \le \binom{p}{2}$.	**15 Marks**
6	Prove that, the path centroid of a tree T is unique and it contains the centroid of T.	**15 Marks**