Notice for the PhD Viva Voce Examination

Mr Libin Chacko Samuel (Registration Number: 1881510), PhD scholar at the School Sciences, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Friday, 28 April 2023 at 10.30 am in the Syndicate Room (Room No. 802), Ground Floor, Auditorium Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis : **A Study on Upper Domatic Number and its Variants in Graphs**

Discipline : **Mathematics**

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The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Place: Bengaluru   **Registrar**
Date: 19 April 2023

ABSTRACT

For a graph $G = (V, E)$, a vertex partition $\pi = \{V_1, V_2, \ldots, V_k\}$ is an upper domatic partition of G if V_i dominates V_j or V_j dominates V_i or both for every $V_i, V_j \in \pi$, whenever $i \neq j$. The upper domatic number $D(G)$ is the maximum order of an upper domatic partition of G. This thesis consists of studies on upper domatic number and its variants in graphs. The bounds of $D(G)$ in terms of order, size, $\omega(G)$ and $\chi(G)$ are established. The class of graphs with equal upper domatic number and clique number is characterised. The relation between upper domatic number and minimum degree of the graph is explored. The case when the upper domatic number and domatic number are equal is investigated and the graphs for which $D(G)$ and $d(G)$ coincide are characterised. Apart from the relation between the $D(G)$ and other graph parameters, the upper domatic number of some special classes of graphs including unicyclic graph, complement of cycles and powers of graphs is determined.

Transitivity, $Tr(G)$, a variant of upper domatic number is defined as the maximum number of sets in a vertex partition $\{V_1, V_2, \ldots, V_k\}$ such that V_i dominates V_j where $1 \leq i < j \leq k$. The results include characterisation of graphs with transitivity at least k, exact values of transitivity of few classes of graphs, few upper bounds of transitivity of graphs, the transitivity of trees and an algorithm to determine the same. Along with this, the concept of total upper domatic number is introduced as a new variant of upper domatic number. The total upper domatic number is the maximum order of a total upper domatic partition of G which is an upper domatic partition such that the graph induced by each partite set does not contain any vertex of degree zero. Basic properties and bounds of upper domatic number in terms of order and maximum degree are discussed. Further, the total upper domatic number of some special classes of graphs is determined.

Keywords: *Domination, Domatic number, Upper domatic number, Transitivity, Total upper domatic number*

Publications:
1. **L. C. Samuel**, M. Joseph, "New results on upper domatic number of graphs", Commun. Comb. and Optim., vol 5, no. 2, pp 125- 137, 2020.
2. **L. C. Samuel**, M. Joseph, "The upper domatic number of powers of graphs", Commun. Comb. and Optim., vol 6, no. 1, pp 53-65, 2021.
3. **L. C. Samuel**, M. Joseph, "Transitivity of trees", Discrete Math. Algorithm Appl., vol 14, no. 6, 2250020, 2022.
4. **L. C. Samuel**, M. Joseph, "Upper domatic number of regular graphs", Discrete Math. Lett., vol 8, pp 16-21, 2022.