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Comparative Analysis of Geometrically Irregular RCC and Steel Frames

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***Abstract**: From various literatures and studies it is found that vertical irregularities are more hazardous in seismic action of building. In the present work emphasis is given on studying effect of geometric irregularities with different geometric shapes such as O, C, H and PLUS along with change in structural Framing Such as RCC framing and Steel framing. All models are analyzed using Staad. PROV8i software According to IS1893:2002 assuming some basis parameters. After analyzing results are plotted and conclusions are drafted from results obtained.*
Keywords: Structural Parameters, Irregularities, Axial force, Displacement, Base shear.

I. INTRODUCTION

There are various types of vertical irregularities such as, vertical discontinuities in the geometry, rigidity, distribution of mass and strength. Buildings with Setback are a subset vertically irregular buildings where there are discontinuities in geometry. However, discontinuity in the distribution of mass, stiffness and strength along the vertical direction. Are major than others The behavior of these types of building is something different. Therefore is a need to work in this regard. So in this work an attempt will be made to reach on more accurate conclusion regarding geometric effects in building during action of seismic forces.

II. AIM

To Analyze and compare various structures with Geometric Irregularities.

III. OBJECTIVE

The objectives of project are as follows :-

A. To study parameters such as base shear, displacement, peak story and story drift.
B. To study seismic response of building with plan discontinuities under earthquake excitations.
C. To propose the best suitable building configuration on the existing condition.
D. To study behavior of RCC and Steel Structures with irregularities.
E. To find the best framing system and framing material.

IV. METHODOLOGY

The methodology for present work is as mentioned below :-

A. In the first phase Decide Aim, Objectives and need of this work.
B. Then Various Literatures will be studied regarding the process of work.
C. Studying Various Parameters related to geometry and irregularity of structure.
D. All general parameters regarding material, their constants, and loading intensities will be decided at this step.
E. Now after doing all above steps No of models and their shapes patterns will be now fixed.
F. Suitable method of analysis (Seismic Co-efficient Method) will now be selected.
G. Suitable type of software (STAAD PRO.) Will be selected for Analysis.
H. After Analyzing all models comparative results will be plotted.
I. Based on obtained results final conclusions will be drafted.
J. At last all references will be made available for future work.

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V. STRUCTURAL PARAMETERS

Table 1 Detail Structural Parameters

Parameter	Value
Live load	2 kN/m2
Density of concrete	25 kN/m3
Thickness of slab	130 mm
Depth of beam	300 mm
Width of beam	230 mm
Dimension of column	300 x 400 mm
Thickness of outside wall	230 mm
Thickness of inner side wall	100 mm (Along Z direction only)
Height of floor	3.5 m
Earthquake zone	III
Damping ratio	0%
Type of soil	II
Type of structure	Special moment resisting frame
Response reduction factor	5
Importance factor	1.5
Roof treatment	1 kN/m2
Floor finishing	1 kN/m2
Number of Storey’s	06 (G+5)

VI. MATERIAL PROPERTIES

Table 2 material properties

Mass Density	2549.3	7849
Unit Weight	25	76.97
Modulus of Elasticity	25000000	20000000
Poisson’s Ratio	0.15	0.3

VII. MODEL NOMENCLATURE

Each model according to its specific floor condition are labeled as follows :-

Table 3 Model Description

Model Description	Label
Model With O shape Irregularity with RCC Frame	VR1
Model With C shape Irregularity with RCC Frame	VR2
Model With H shape Irregularity with RCC Frame	VR3
Model With PLUS shape Irregularity with RCC Frame	VR4
Model With O shape Irregularity with STEEL Frame	VR5
Model With C shape Irregularity with STEEL Frame	VR6
Model With H shape Irregularity with STEEL Frame	VR7
Model With PLUS shape Irregularity with STEEL Frame	VR8

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VIII. 3D VIEW OF MODELS

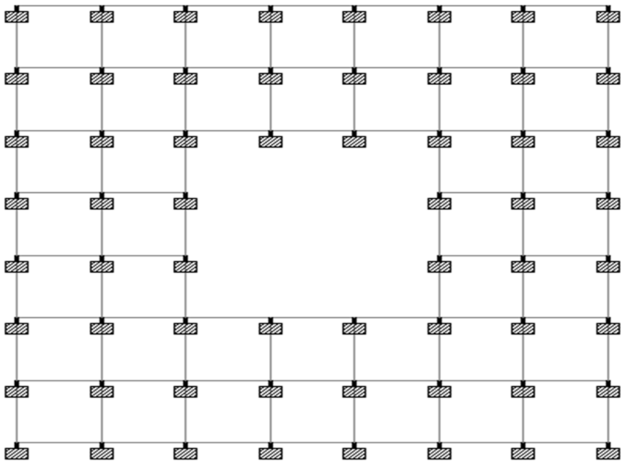

Fig.01 Plan of O shape building

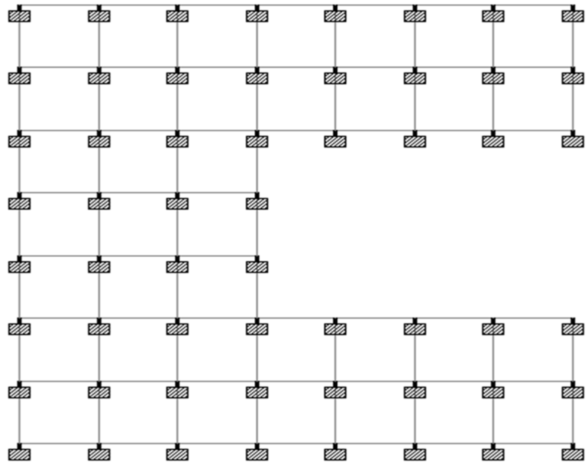

Fig.02 Plan of C shape building

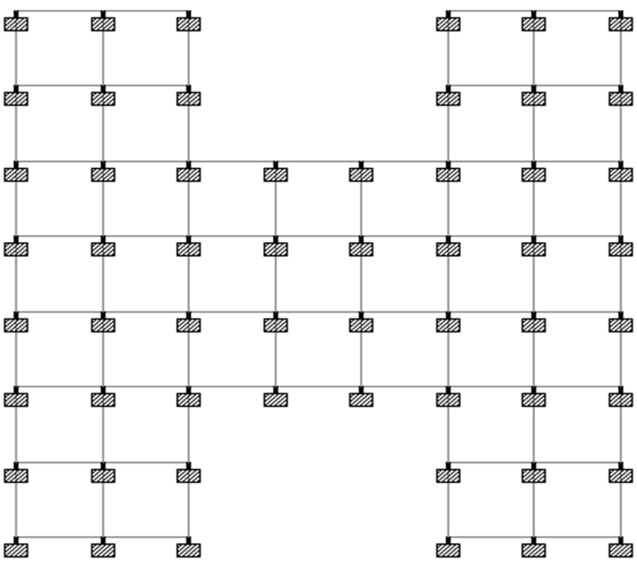

Fig.03 Plan of H-shape Building

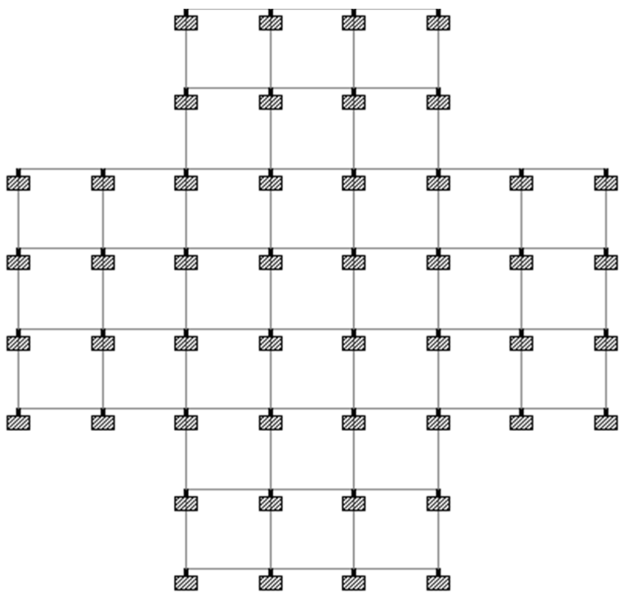

Fig.04 Plan of C-shape Building

IX. RESULTS FOR ALL MODELS

A. *RCC Framed Building*

Table 04 comparative results of RCC framed models

Sr. No.	Model	Max Axial Force	Displacement	Base shear
01	VR1	1379.86	72.41	1184.07
02	VR2	1088.67	63.20	947.13
03	VR3	1070.61	58.66	947.13
04	VR4	1075.40	60.58	836.59

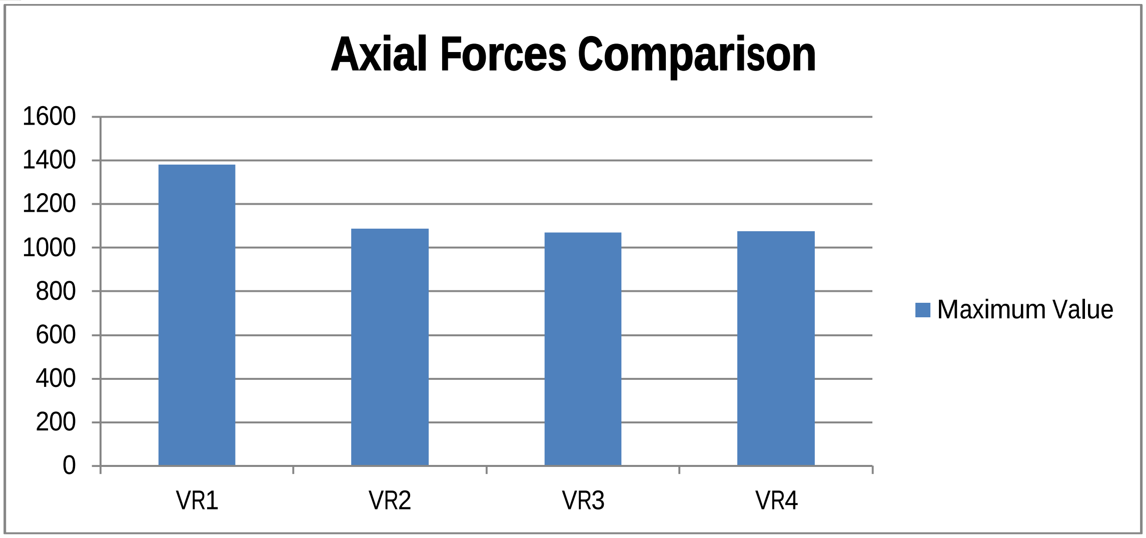

Fig.05 Comparison of axial forces for RCC frames

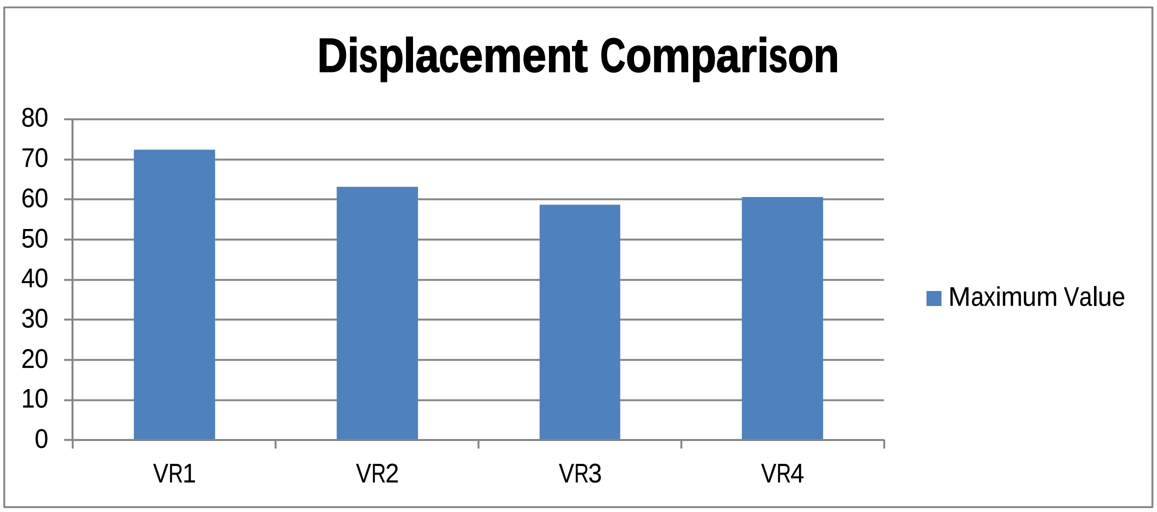

Fig.06 Comparison of Displacement for RCC frames

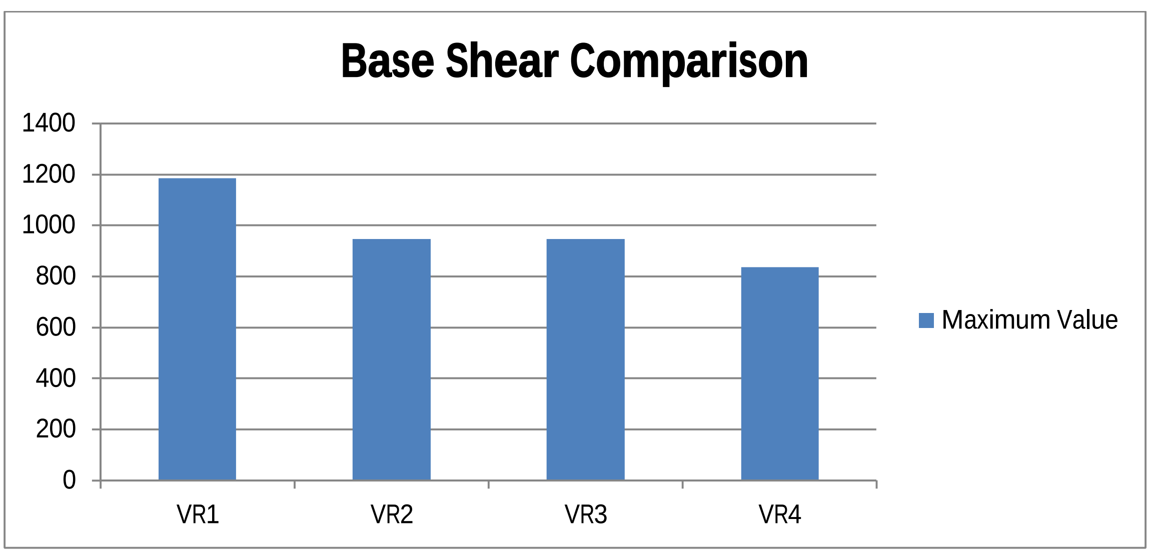

Fig.07 Comparison of Base Shear for RCC frames

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B. Steel Framed Building

Fig.05 Comparison Results of Steel Framed Models

Sr. No	Model	Max Axial Force	Displacement	Base shear
01	VR5	1470.58	97.07	1219.91
02	VR6	1138.00	86.17	935.34
03	VR7	1098.06	87.92	990.78
04	VR8	1099.77	90.73	878.99

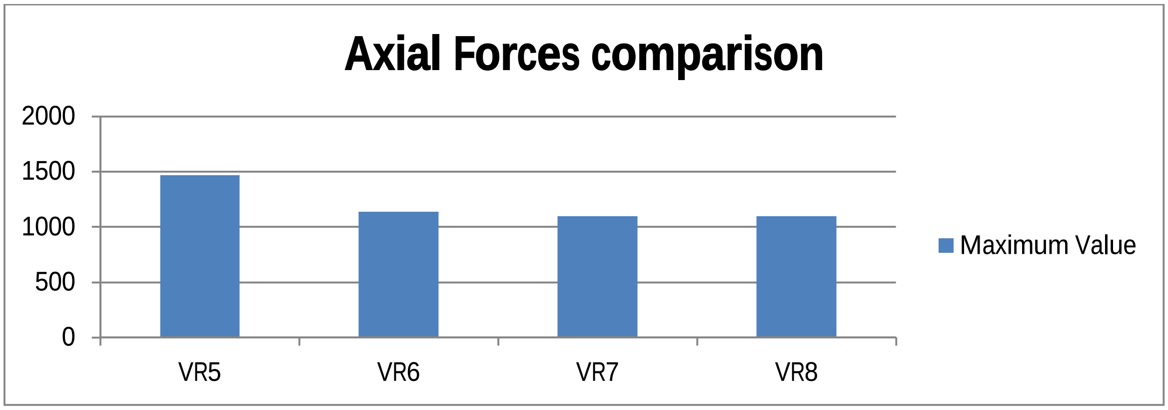

Fig.08 Comparison of axial forces for Steel frames

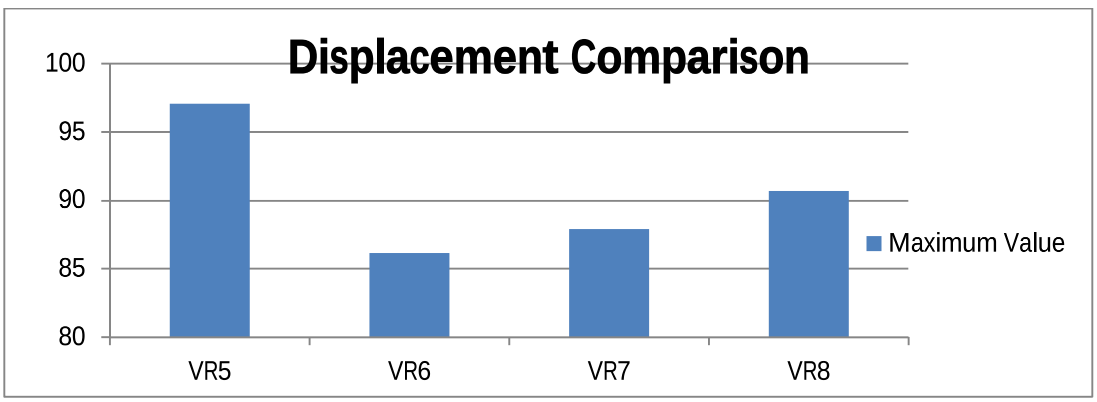

Fig.09 Comparison of Displacement for RCC frames

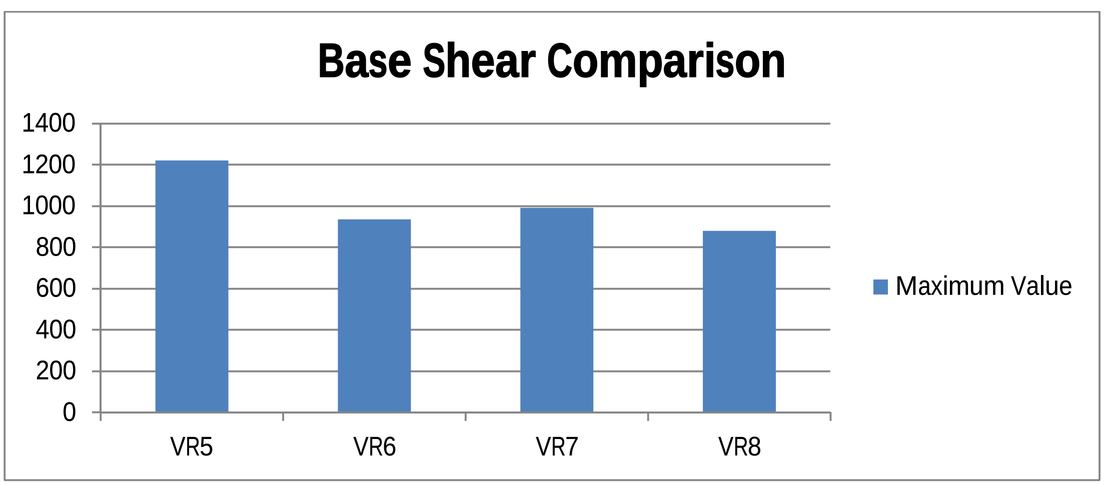

Fig.10 Comparison of Base Shear for Steel frames

X. CONCLUISONS

A. In RCC Framing building with H- shape geometry gives lower Axial force and also low displacement values.
B. Similarly in Steel framing building H-shape building gives lower values of Axial Forces and Displacement.
C. In both case of framing material PLUS shape building gives less base shear than other buildings.
D. C-shape building gives comparatively lower values of displacements compared to other geometric shapes.

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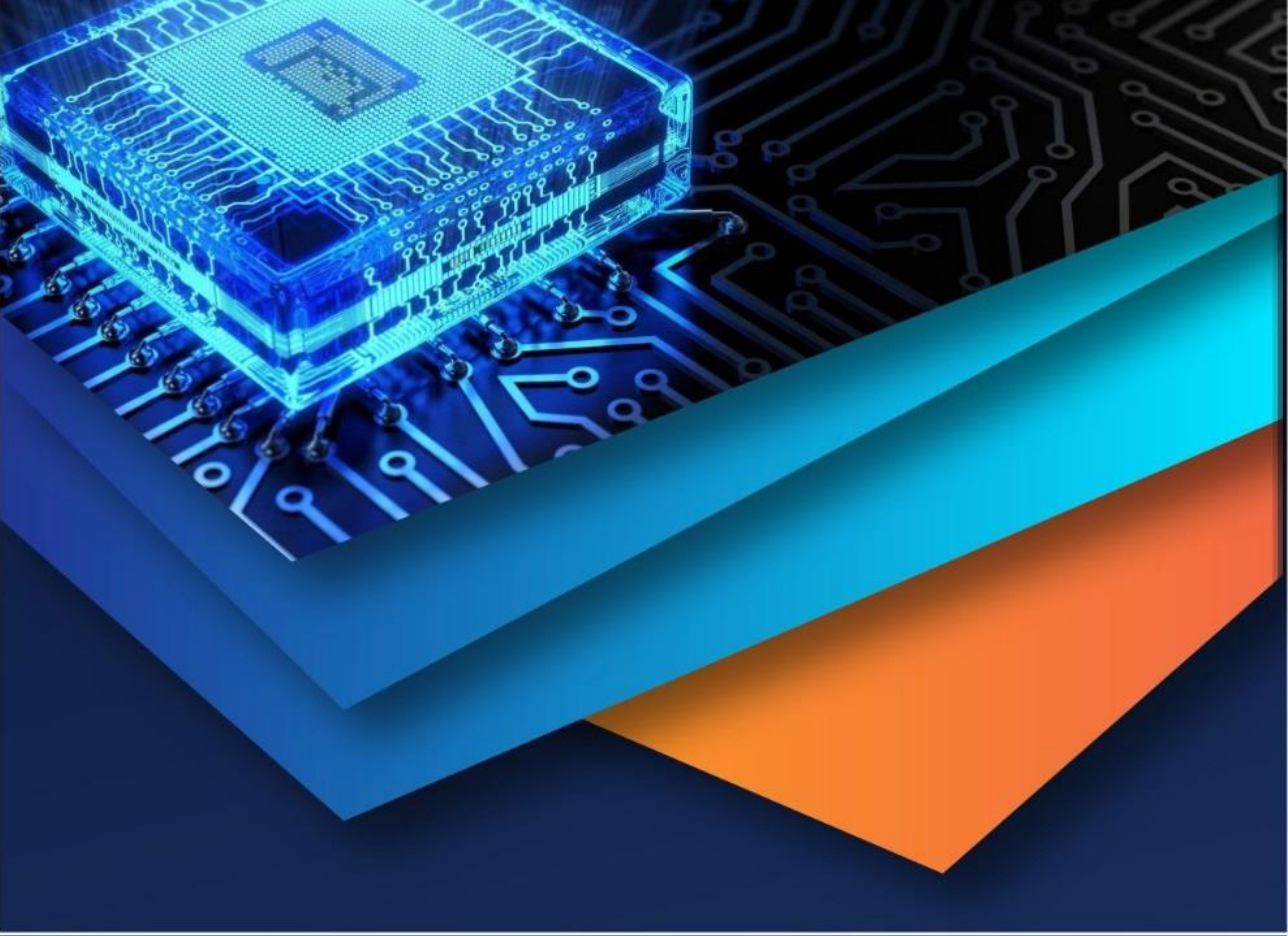

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