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# Analysis of A Tall Structure on Terrain Ground Considering Seismic Effect

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**Abstract***: This research paper consists on "seismic Analysis of RCC Buildings on Hilly Terrain" as per I.S. 1893 part1. (Structures) on sloping ground require more importance in analysis than those on plane strata. Structures on the slanting grounds are constantly unpredictable and unsymmetrical in both flat and vertical headings and have establishment have at various levels. All this means center of mass and center of rigidity do not coincide with each other, which requires considering torsional effect during analysis. Short columns affect more damage in earthquake. Such buildings pose special structural and constructional problems. Here we will discuss the results terms of Axial force, maximum bending moment and storey displacement.*
**Keywords***: staad.pro, storey displacement, max bending moment, structural analysis, seismic analysis*

## I. INTRODUCTION

In many parts of the world, Seismic load is concerned the issue with respect to the wellbeing of existing structures. In the previous couple of years, structures were outlined and built by before code arrangements (with or without considering Earthquake Forces), don't fulfill necessities of current seismic code and configuration hones. Along these lines, it is fundamental to make safe unsuitable perils to property and life of tenants, postured amid future seismic tremor. The wellbeing from risks is conceivable by method for seismic assessment and execution, retrofitting of deficient existing building structures. Catastrophe because of Earthquake has dependably been one of the best common disasters push onto the humankind since time immemorial, acquiring its wake untold agonies and hardships to the general population influenced.

North and north eastern parts of India have huge extends of uneven landscape, which are ordered under seismic zone II, III, IV and V. In this locale the development of multistory RCC surrounded structures on slope inclines is in squeezing request, because of monetary development and fast urbanization. This development in development action is adding to gigantic increment in populace thickness. While developing, it must be noticed that Hill structures are unique in relation to those in fields i.e., they are exceptionally sporadic and unsymmetrical in even and vertical planes, and torsionally coupled. Since there is shortage of plain ground in slopes, it commits the development of structures on inclines.

In this study we considered sloping angle of 0o, 7o and 14 degree, seismic zone III & V, soil type soft and medium.and G+10 structure.

SUJIT KUMAR et al. (2014) [1] observed the behavior of slanting ground structures considering inclinations of (7.50, 15o) under seismic forces. Considering seismic zones comparison has been done on sloping ground and plane ground building. Here G+ 4 storey is taken with same properties and loadings for its conduct and comparison. And observed that vertical forces remain same whereas vertical force and bending moment increases with increase in sloping angels.

S.M.Nagargoje et al. (2012) [8] compared sloping ground and plain ground building ranging from storey 4 to15 with same properties the seismic analysis of buildings are carried out by Seismic coefficient method by using IS 1893(part I) -2002 considering seismic zone III. They concluded that Top storey displacement of Step back building is quite high as compared to Step back-Setback building resting on sloping ground. Step back-Setback building may be Favored on sloping group. Primary objectives of our study :

Is to determine the effect of different seismic zones.
To determine the impact due to sloping ground
To find out the variation due to different types of soil considered

## II. METHODOLOGY

This study deals with comparative study of Earthquake behavior on high rise structures G+10 building frame with three different soil types and different slope of ground as $0^0$, $7^0$ and $14^0$. Under the Earthquake effect as per IS 1893(part I) -2002 static analysis. A

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comparison of analysis results in terms of Maximum bending moment, Maximum Storey Displacement, Maximum shear force has been carried out

This study is attempted in following steps:

draw model in staad pr

provide proper slope

provide proper property and supports

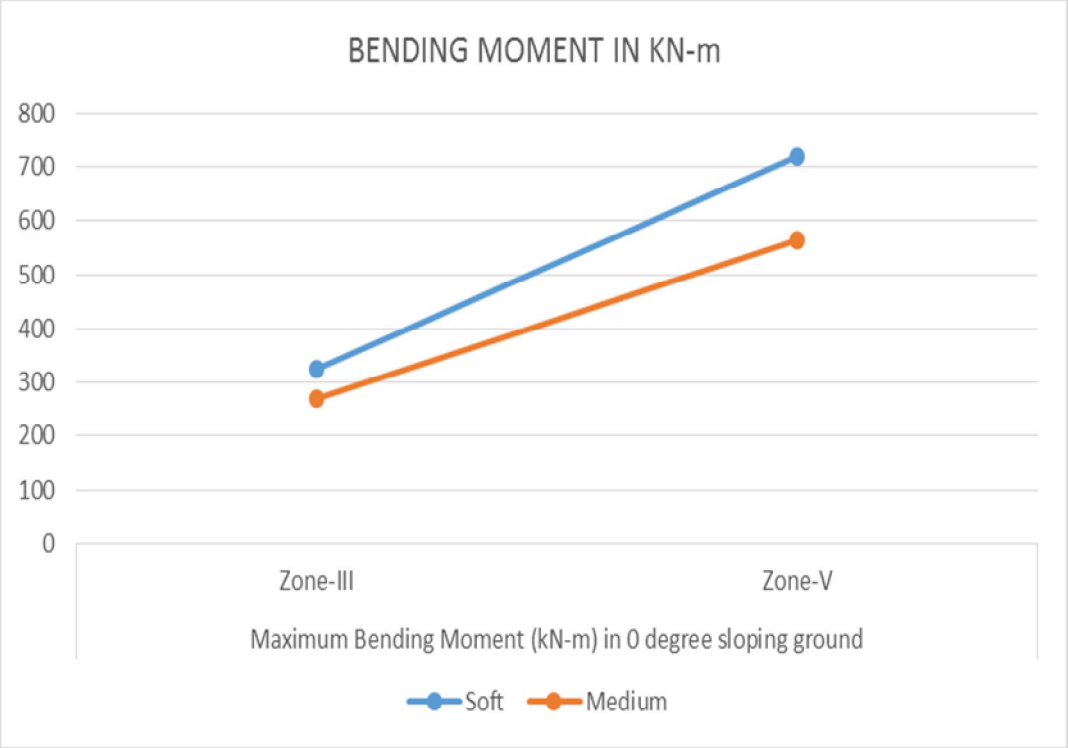
provide seismic loading as per code 1893 part-1

analyse structure.

## III. RESULT AND ANALYSIS

*A. Bending moment*

| Soil Type | Maximum Bending Moment (kN-m) in 0 degree sloping ground | |
|---|---|---|
| | Zone-III | Zone-V |
| Soft | 325.76 | 718.36 |
| Medium | 268.38 | 565.5 |




| Soil Type | Maximum Bending Moment (kN-m) in 7 degree sloping ground | |
|---|---|---|
| | Zone-III | Zone-V |
| Soft | 434.3 | 981.52 |
| Medium | 342.16 | 805.79 |

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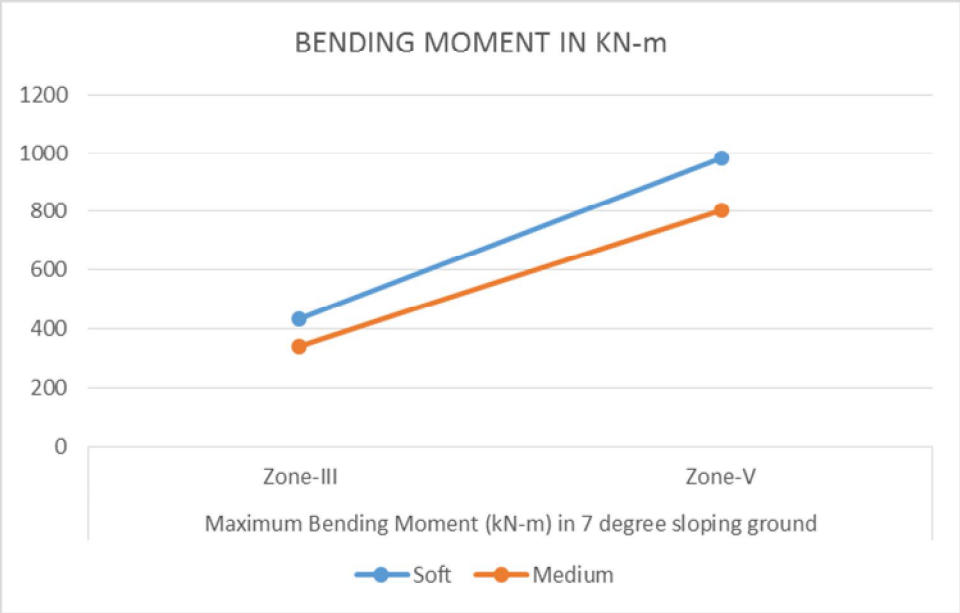
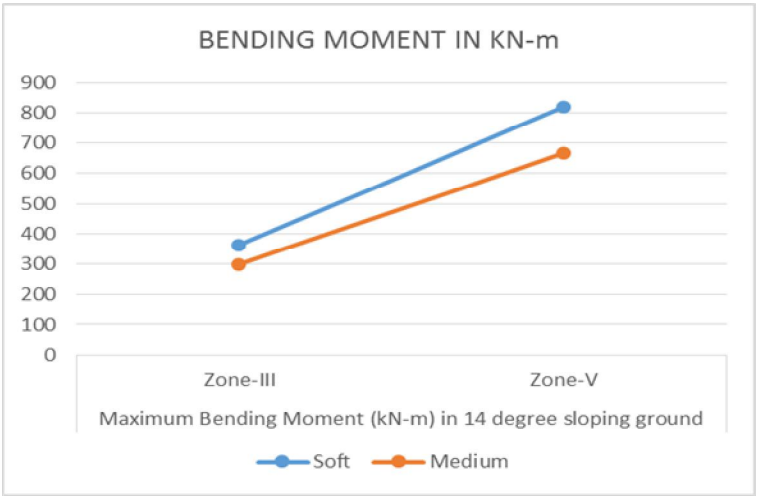



| Soil | Maximum Bending Moment (kN-m) in 14 degree sloping ground | |
|---|---|---|
| | Zone-III | Zone-V |
| Soft | 360.83 | 820.39 |
| Medium | 298.39 | 666.81 |




1. Axial force

| Soil type | Axial force kN in 0 degree slope | |
|---|---|---|
| | Zone III | Zone V |
| Soft | 3216.65 | 4761.49 |
| Medium | 3216.65 | 4194.12 |

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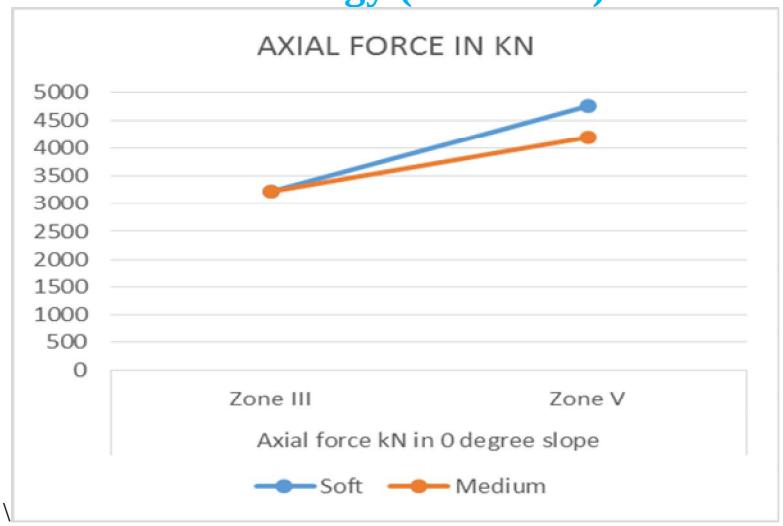
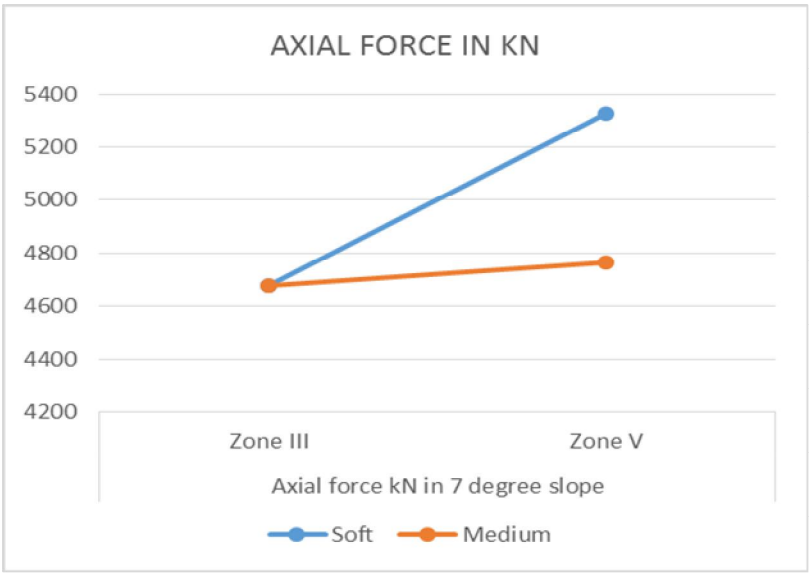



| Soil type | Axial force kN in 7 degree slope | |
|---|---|---|
| | Zone III | Zone V |
| Soft | 4676.79 | 5327.35 |
| Medium | 4676.79 | 4765.81 |




| Soil type | Axial force kN in 14 degree slope | |
|---|---|---|
| | Zone III | Zone V |
| Soft | 4417.75 | 5491.66 |
| Medium | 4417.75 | 4899.45 |

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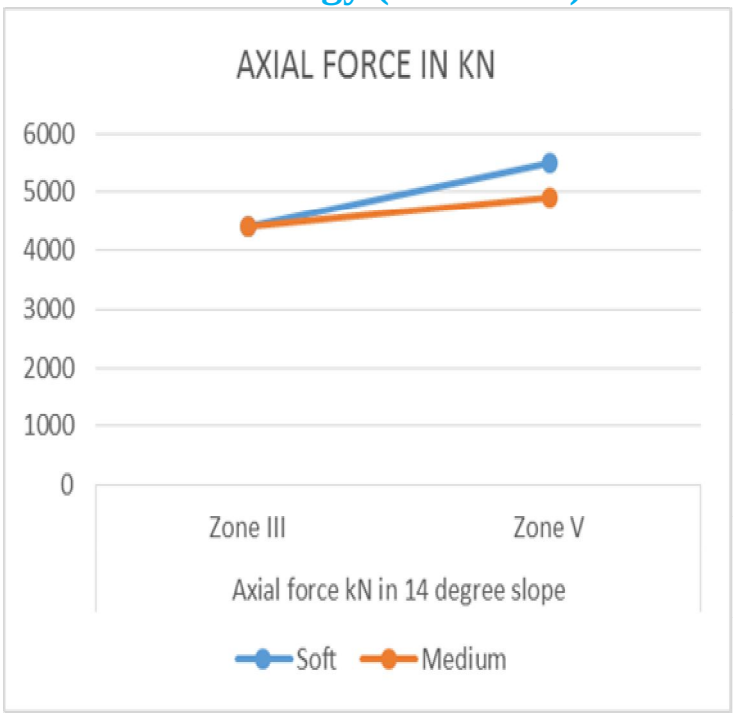


*B. Storey displacement*

| Storey | Storey Displacement (mm) 0 degree slope | |
|---|---|---|
| | ZONE-III | ZONE-V |
| Base | 0 | 0 |
| GF | 6.94 | 12.43 |
| 1st Storey | 17.62 | 36.28 |
| 2nd Storey | 26.66 | 61.04 |
| 3rd Storey | 38.52 | 87.12 |
| 4th Storey | 51.29 | 112.15 |
| 5th Storey | 59.81 | 136.25 |
| 6th Storey | 71.78 | 156.15 |
| 7th Storey | 78.58 | 177.84 |
| 8th Storey | 87.82 | 192.16 |
| 9th Storey | 93.32 | 206.12 |
| 10th Storey | 97.83 | 213.83 |

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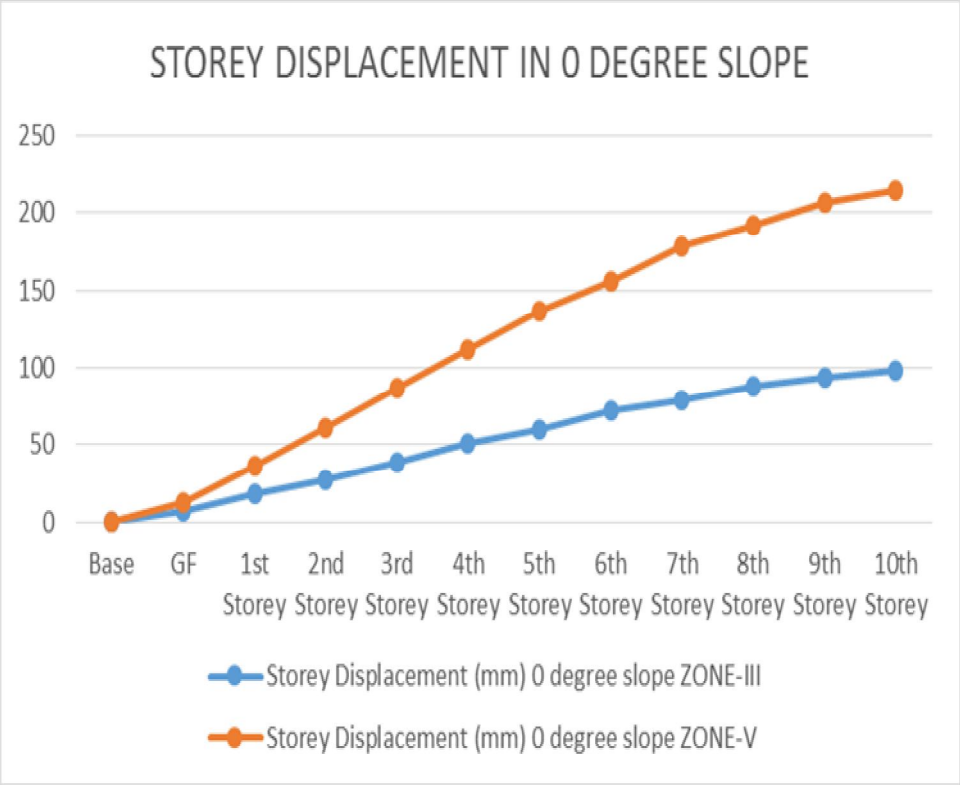


| Storey | Storey Displacement (mm) 7 degree slope | |
|---|---|---|
| | ZONE-III | ZONE-V |
| Base | 0 | 0 |
| GF | 2.83 | 4.25 |
| 1st Storey | 9.23 | 21.57 |
| 2nd Storey | 19.28 | 45.79 |
| 3rd Storey | 31.38 | 72.19 |
| 4th Storey | 42.52 | 94.79 |
| 5th Storey | 55.87 | 122.13 |
| 6th Storey | 62.93 | 144.42 |
| 7th Storey | 71.59 | 167.21 |
| 8th Storey | 78.72 | 173.42 |
| 9th Storey | 84.12 | 192.59 |
| 10th Storey | 87.63 | 197.83 |

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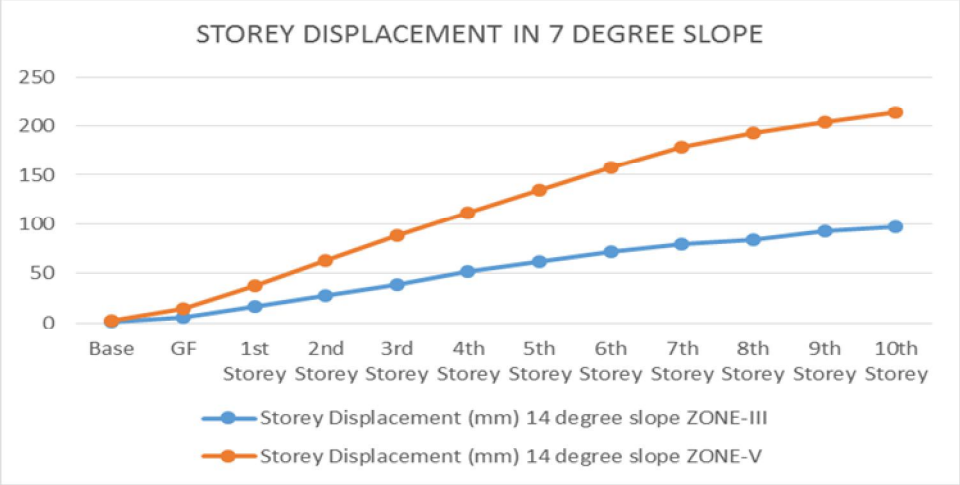
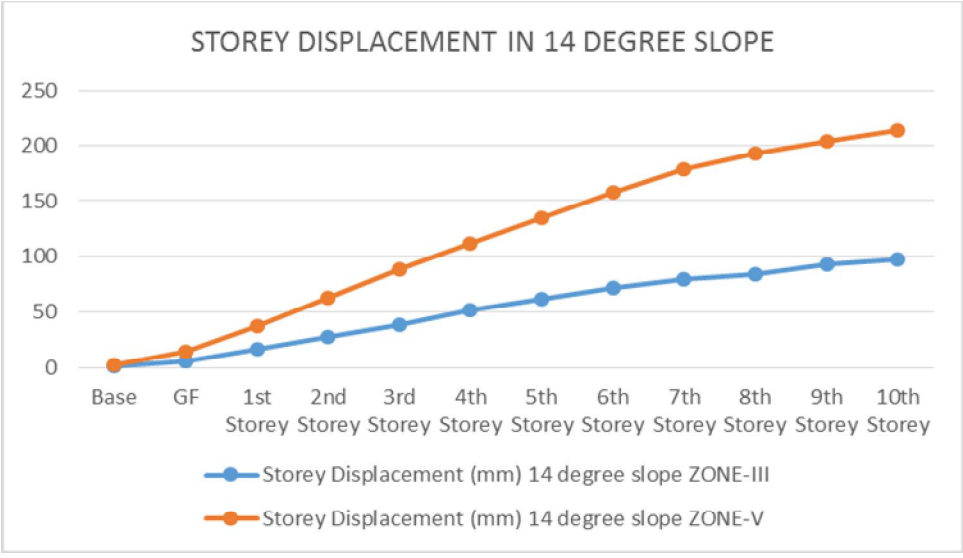



| Storey | Storey Displacement (mm) 14 degree slope | |
|---|---|---|
| | ZONE-III | ZONE-V |
| Base | 0.91 | 2.23 |
| GF | 6.08 | 14.89 |
| 1st Storey | 16.13 | 37.81 |
| 2nd Storey | 27.5 | 63.25 |
| 3rd Storey | 38.27 | 88.19 |
| 4th Storey | 51.35 | 111.86 |
| 5th Storey | 61.87 | 134.22 |
| 6th Storey | 71.88 | 157.19 |
| 7th Storey | 79.81 | 178.47 |
| 8th Storey | 83.45 | 192.38 |
| 9th Storey | 92.13 | 204.15 |
| 10th Storey | 96.9 | 214.19 |



## IV. CONCLUSION

Our study concluded that plain ground buildings are most suitable in comparison to sloping ground.

The buildings which are resting on sloping ground are subjected to short column effect, attract more base shear &forces and are worst affected during seismic excitation. Maximum storey displacement in observed as we are increasing slope therefore maximum in 14 degree slope where as maximum bending moment, shear force is shown in soft soil and seismic zone V as compared to seismic zone III and hard strata.

From the study, it is observed that the building which are resting on sloping are subjected to short column effect , attract more forces and are worst affected during seismic excitation. Hence form design point of view, special attention should be given to the size, orientation, and ductility demand of short column . it is also found that the hill slope building are subjected to significant torsional effects due to uneven distribution of Axial force in the various frames of building suggest development of torsional movement which is found to be higher on a sloping ground building. This values further reinforce the concept of short column effect as well as torsion and twisting develop in structure due to uneven heighted column.

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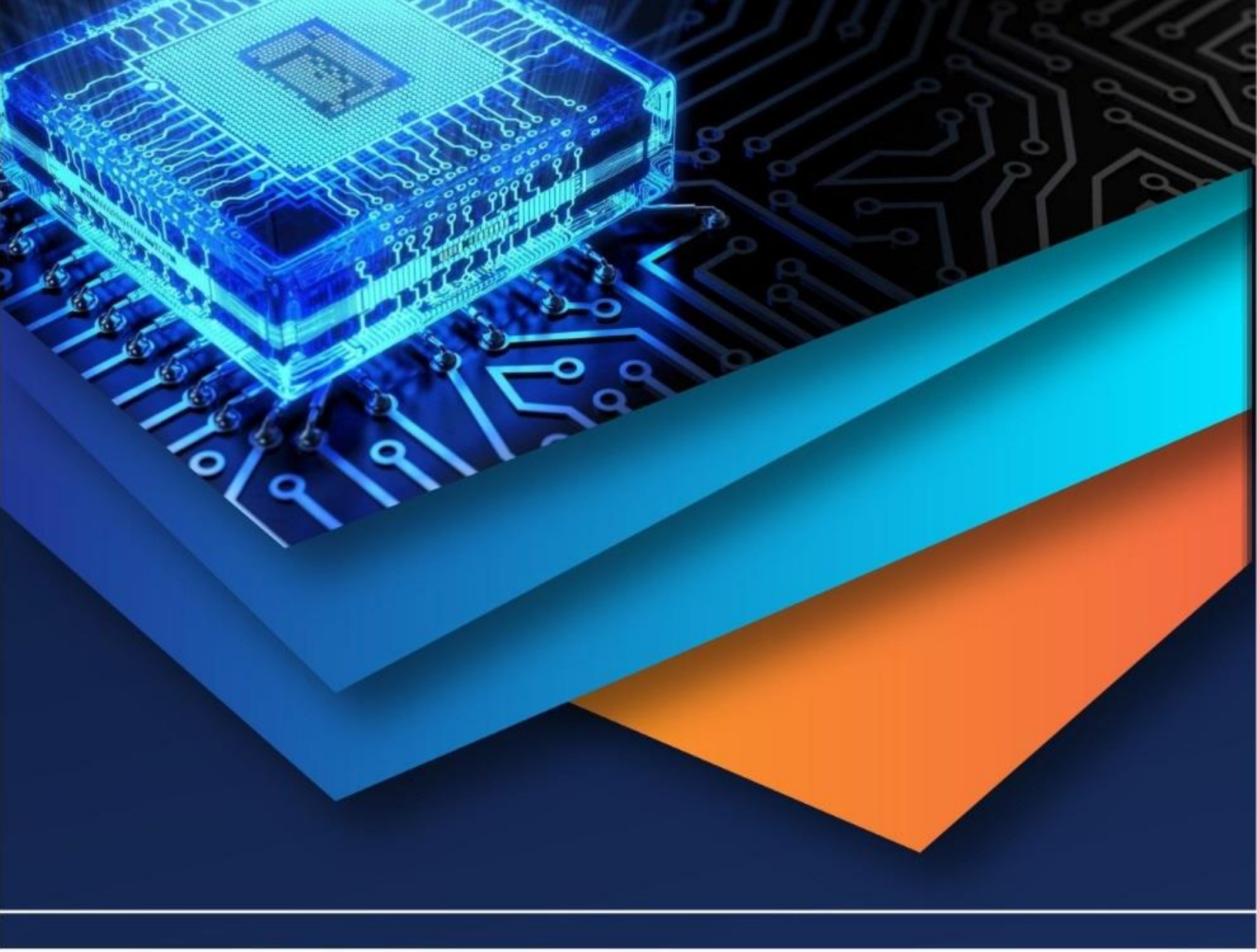

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