iJRASET
International Journal For Research in
Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 9 **Issue:** V **Month of publication:** May 2021

**DOI:** https://doi.org/10.22214/ijraset.2021.34218

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue V May 2021- Available at www.ijraset.com

# Comparative Structural Analysis of Raft Foundation with Different Soil Conditions

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***Abstract: Civil engineering structures such as building must have sufficient safety margin under dynamic loading like earthquake. The dynamic performance of a RCC building can be determined accurately that requires appropriate modelling considering foundation-soil, building-foundation and soil interactions.***
***Building-foundation-soil interactions are complex phenomena requiring advanced mathematical and numerical modelling. Raft-foundation is obligatory where soils have low bearing-capacity and when they have to support substantial structural loads. Usually structures on marshy-land, soft-clay and land that are made-up of sanitary land-fill or other materials necessitate raft-foundation.***
***Keywords: Raft-foundation, Parametric study, Raft Thickness and analysis***

## I. INTRODUCTION

Every structure is divided into 2 parts. They are substructure and superstructure. It is constructed below the ground level and superstructure is constructed above it. It is the bottommost part of the building or a structure. The main function of the substructure is to transmit the loads from the superstructure to the underneath soil.
Raft-foundation is constructed of RCC slab covering the entire area of the foot of the building. Steel reinforcing bars are provided in both the directions.
Raft-foundation is obligatory where soils have low bearing-capacity and when they have to support substantial structural loads. Usually structures on marshy-land, soft-clay and land that are made-up of sanitary land-fill or other materials necessitate raft-foundation. Raft-foundations are usually favored in the soil that are assumed to undergo subsidence.

## II. REVIEW OF LITERATURE

Chandiwala, A.K. et al [1] studied systematic guidelines for determining the natural periods of framed buildings due to the effect of soil-flexibility and identification of spring stiffness for different regular and irregular story buildings and various influential parameters are identified.
Chore, H.S. et al [2] established nonlinear dynamic response of buildings on two different soft soils including soil–structure interaction.
For each building on each soil type a suit of 10 consistent earth-quake motions were considered and scaled through a rational procedure. Responses of buildings including maximum base shear, story drift, and plastic hinge rotation were calculated.
Mali, S. et al [4] studied soil, foundation, and superstructure interaction for plane two-bay frames were studied. Effect of the superstructure rigidity on the damping of differential settlement in consideration to the redistribution of loads was investigated. The results of five model groups with 54 frames were collected and studied for each group.

## III. MODELING

The modeling is carried out in the BridgeLink software, mentioned as follows.

1) *Model-I:* G+5 Building-symmetrical
2) *Model-II:* G+7 Building-symmetrical
3) *Model-III:* G+10 Building-symmetrical
4) *Model-IV:* G+12 Building-symmetrical
5) *Model-V:* G+15 Building-symmetrical

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The following parameters are considered for the modeling

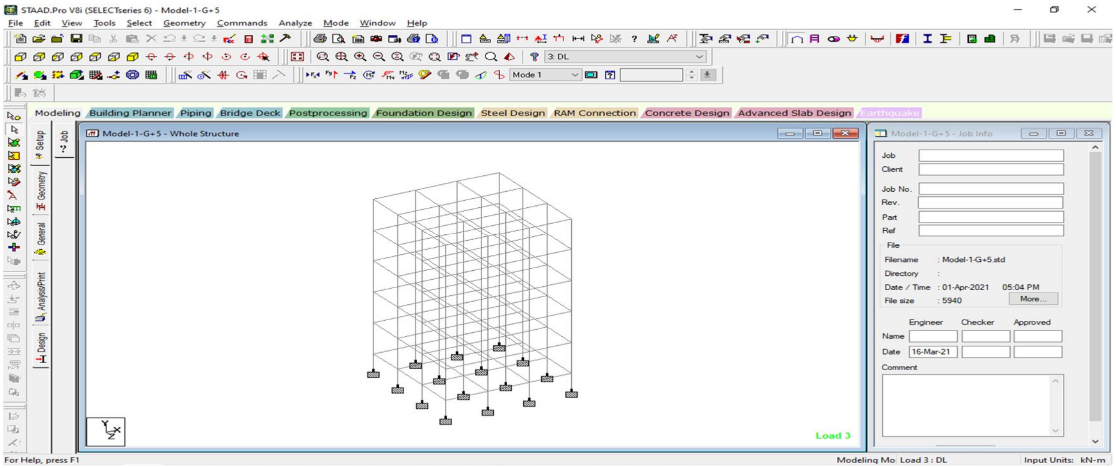

Figure 1: Elevation of model-I

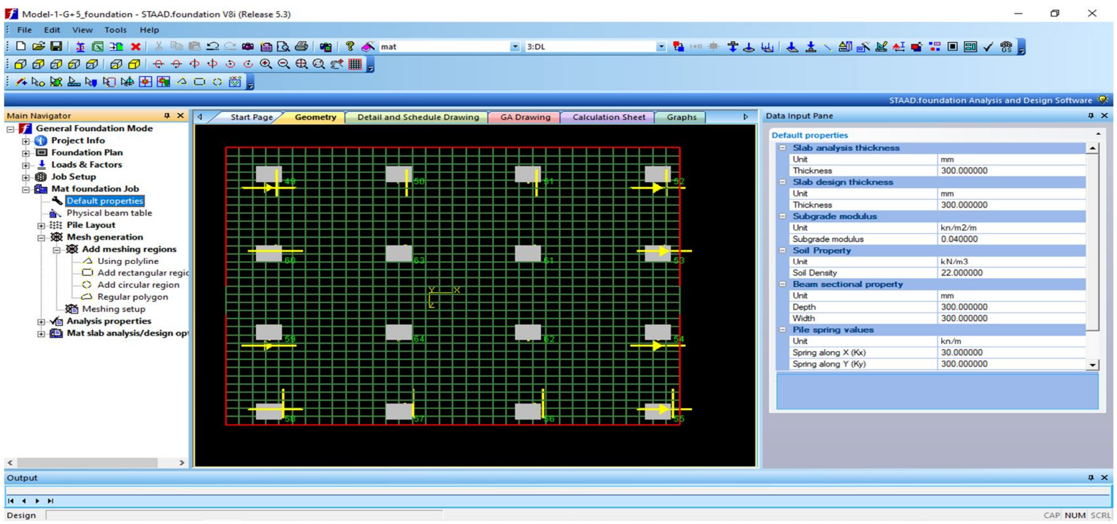

Figure 2: Soil properties of model-I

The soil properties are mentioned and given input in the STAAD- Foundation software as mentioned in the above figure.

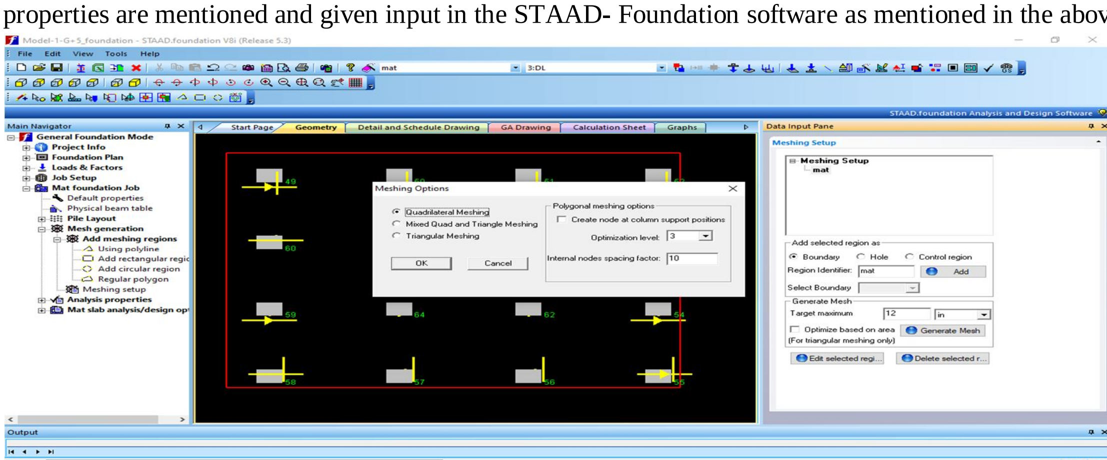

Figure 3: Meshing of the Foundation for model-I

The quadrilateral meshing is assigned while considering the mat foundation for the model-I as shown in the figure.

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## IV. RESULTS

The analysis is carried out in BridgeLink software and the results in terms of shear force, bending moment and other parameter is obtained as follows.

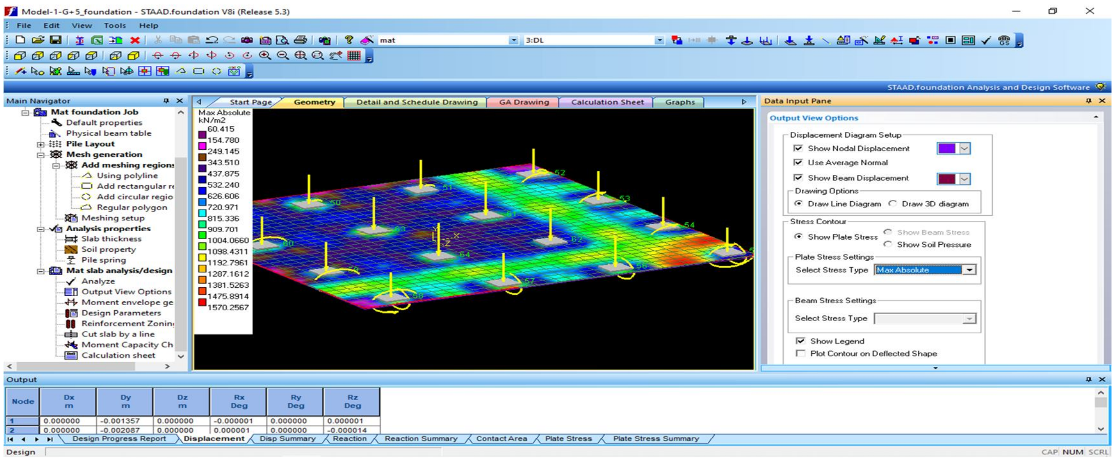

Figure 4: Maximum absolute stress of model-I

The maximum absolute stress of 1570.26 kN/m$^2$ is observed as in the red color as per the above figure for the model-I.

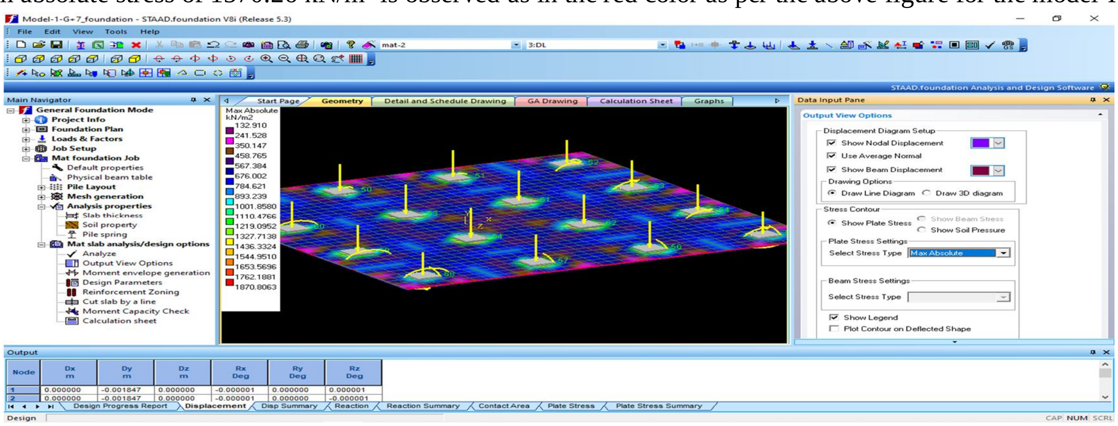

Figure 5: Maximum absolute stress of model-II

The maximum absolute stress of 1870.81 kN/m$^2$ is observed as in the red and pink color as per the above figure for the model-I.

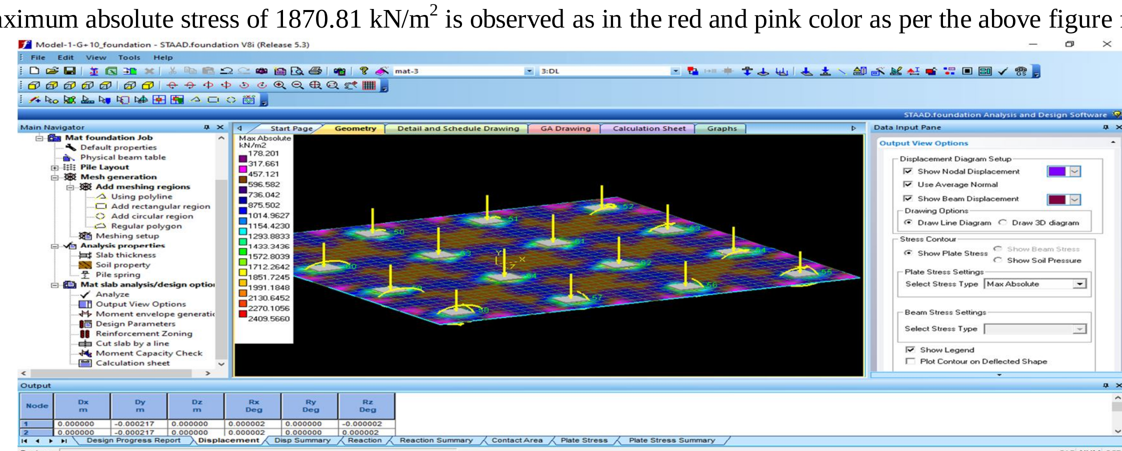

Figure 6: maximum absolute stress of model-III

The maximum absolute stress of 2409.56 kN/m$^2$ is observed as in the red color as per the above figure for the model-III.

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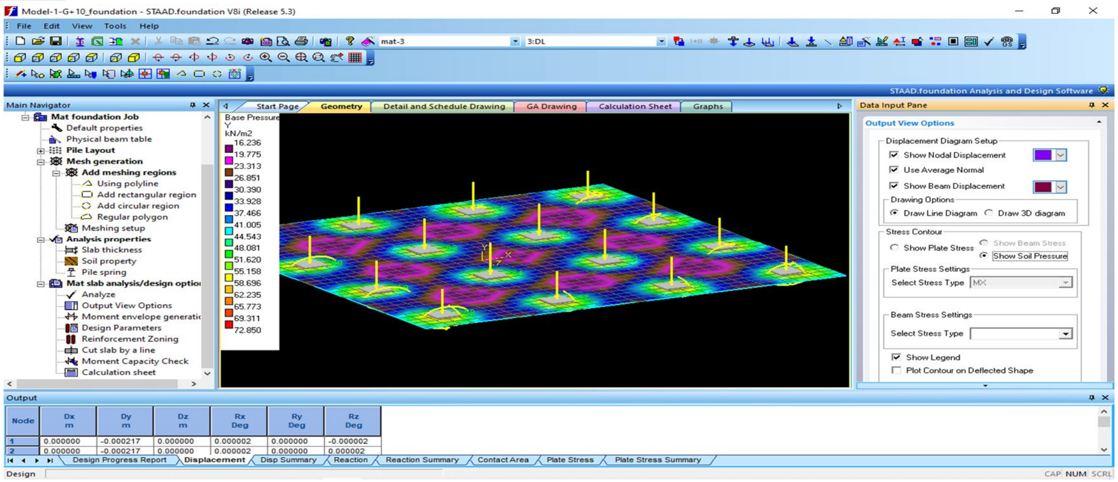

Figure 7: Base soil pressure of model-III

The maximum base soil pressure of 72.85 kN/m$^2$ is observed as in the red color as per the above figure for the model-III.

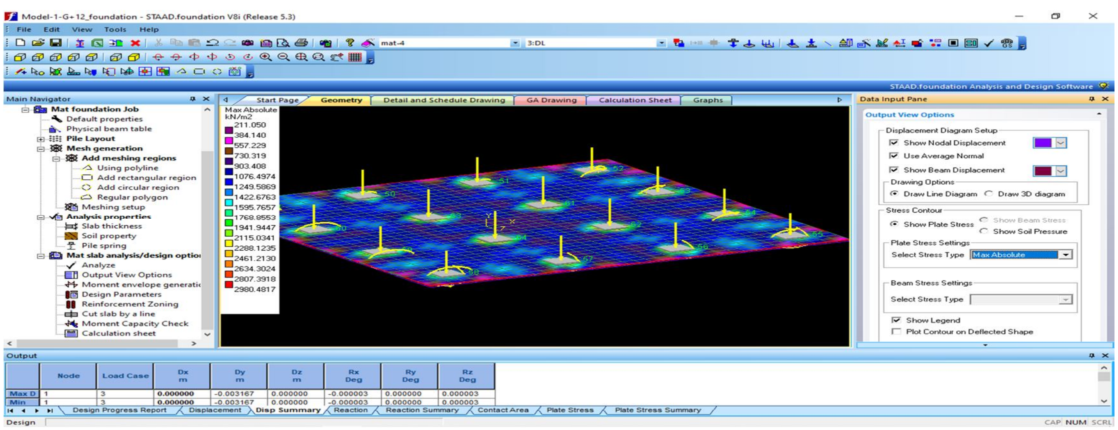

Figure 8: Maximum absolute stress of model-IV

The maximum absolute stress of 2980.48 kN/m$^2$ is observed as in the red color as per the above figure for the model-IV.

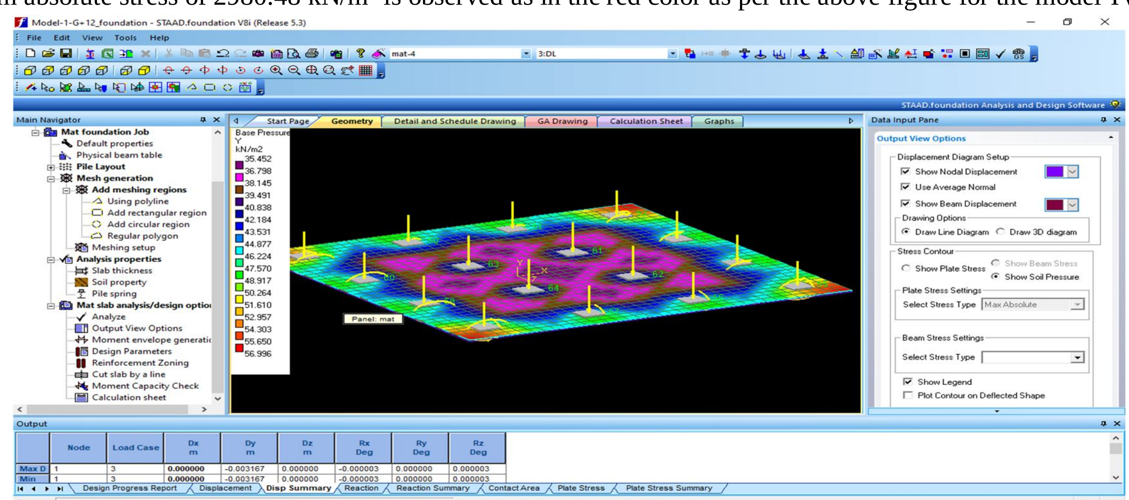

Figure 9: Base pressure diagram for model-IV

The maximum base soil pressure of 56.996 kN/m$^2$ is observed as in the red color as per the above figure for the model-IV.

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## V. CONCLUSION

The conclusions from the above study are as follows:

*A.* The maximum absolute stress of 1570.26 kN/m2 is observed as in the red color as per the above results for the model-I
*B.* The maximum absolute stress of 1870.81 kN/m2 is observed as in the red and pink color as per the above results for the model-I
*C.* The maximum moment (Mx) is observed as 26.923 kNm/m as in the red color strip for the case of model-II
*D.* The maximum absolute stress of 2409.56 kN/m2 is observed as in the red color as per the above results for the model-III
*E.* The maximum base soil pressure of 72.85 kN/m2 is observed as in the red color as per the above results for the model-III.

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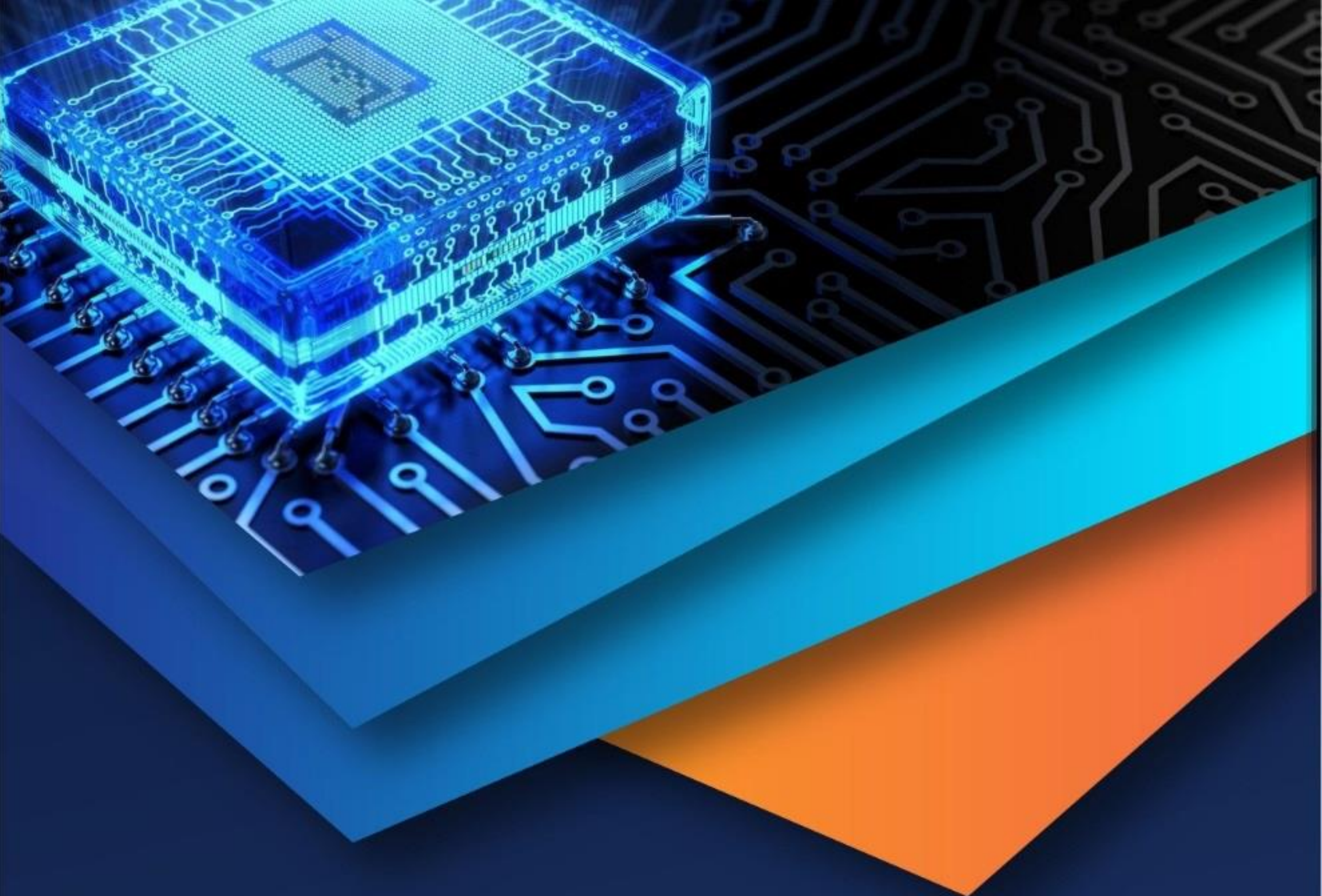

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