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Review Paper on Analysis and Design of Residential G+4 Building by Using STAAD Pro

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Abstract: ***It is important for designers to save time in order to be competitive in the increasingly competitive market. There are many ways to examine different frames using paper and pencil, such as the kani's method, cantilever method, the portal method and the matrix method.***
However, with the help of the integration of various engineering methods, the determination of various changes in the calculation text (i.e. text-based), durability, deformation are failures caused by hidden objects has changed and brought this system to a new level.
STAAD PRO (Structural Analysis and Design) is a software that integrates all large-scale analysis, static, dynamic, linear and non-linear, especially for residential analysis and design. Our project "G+4 Inspection and Design of Residential Buildings Using STAAD PRO Software" is an attempt to inspect and design buildings using STAAD PRO. In this study, the construction of G+4 buildings is discussed. Inspection by static method and design as per IS 456:2000 guidelines. Content - co-loading, multiple stories, analysis, design, STAAD Pro;
Keywords: Dead Load, Live Load, Multi-Storied Building, Analysis, Design, STAAD Pro;

I. INTRODUCTION

The term structure in Civil Engineering is used to mean a structure having colorful factors like foundation, walls, columns, bottoms, roofs, doors, windows, ventilators, stairs, lifts, colorful types of face homestretches etc. structures come in a wide quantum of shapes and functions, and have been acclimated throughout history for a wide number of factors, from erecting accoutrements available, to rainfall conditions, to land prices, ground conditions, specific uses and aesthetic reasons.

A Multi-Stored is a structure that has multiple bottoms above ground in the structure. Multi-story structures aim to increase the bottom area of the structure without adding the area of the land the structure is erected on, hence saving land and, in utmost cases, plutocrat (depending on material used and land prices in the area).

The design process of multi-story structure requires not only imagination and abstract thinking but also sound knowledge of the wisdom of structural engineering besides the knowledge of practical aspects, similar as recent design canons, bye laws, backed up by ample experience, suspicion and judgment. The purpose of norms is to insure and enhance the safety, keeping careful balance between frugality and safety Structural analysis and design is used to produce a structure able of defying all applied loads without failure during its willed life. Structural analysis is a branch in which the goods of the different structural factors on the order of vaticination of the geste of the structures.

Every structure is made liable to one or both orders of loads, the different cargo types are the endless cargo, assessed cargo, seismic cargo and wind cargo. STAAD PRO (Structural Analysis and Design Program) is a software that integrates all major static, dynamic, direct and on-linear analysis. The main intention of the software is to design multi-Storey structures in the process of the system. Principally, structures currently are of two types of erecting systems, a

1) Load bearing masonry building
2) Framed buildings

II. LITERATURE SURVEY

1) According to the authors' review, the provident prosecution of a concrete structure depends more on the overall layout of the structure with respect to the construction feasibility and cost (called construct capability) than on its theoretical analysis. This knowledge regarding the frugality is generally acquired only through experience and study of systems formerly carried out. As civil masterminds will be called upon to carry out design of structures to be constructed as well as dissect (or review) structures formerly constructed, they should be familiar with the current canons and styles of design and analysis.

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2) According to the author's exploration, earthquakes beget different shaking intensities at different locales and the damage convinced in structures at these locales is also different. Therefore, it's necessary to construct a structure which is earthquake resistant at a particular position of intensity of shaking and assimilate the effect of earthquake. Indeed though the same magnitude of earthquakes are being due to its varying intensity, it results in different dangerous goods in different regions. Flat crossbeams system of construction is one in which the shafts used in the present study are limited to response diapason analysis of this flat arbor marketable structure for 3 different zones. There's a gradational increase in the values of side forces from nethermost bottom to eclipse bottom. The maximum story relegation is increased as the seismic zone goes from II to IV.

3) In this ultramodern technology of the 21st century as urbanization increases the vacuity of land is getting less, due to high population and cost of land getting advanced. To overcome this problem, the only result is to prefer high rise structures. The effective design and construction of earthquake and wind resistance structures have much lesser significance each over the world. The analysis and design of a multistoried structure was done as part of our design. The study helped us to gain ample exposure to colorful field practices in the analysis and design of multistoried structures, and also in colorful construction ways used in the assiduity. The analysis was done in ETABS 2015 and detailing was done in bus CAD 2010 “Seismic and Wind Analysis – Design of G 11 multi- story RC domestic structure. The design is completed with reference to the Indian standard canons in planning. We've used AutoCAD, Elevation, and Interior and Exterior design with reference to National Building Code 2005 Completed.

4) ETABS is the present day leading design software in the request. Numerous design company’s use this software for their design design purpose. So, this paper substantially deals with the relative analysis of the results attained from the analysis of a multi fabled structure structure when anatomized manually and using ETABS software. Our design deals with provision of earthquake resistant structure which is also profitable. Minimal sizes of the shafts and columns were handed as B230mmX450mm and C230mmX450 mm, after analysis only the failed column axes and confines were changed to C230mmX750 mm which comes under economics. Seismic analysis was done by using ETABS software and successfully vindicated manually as per IS 1893- 2002. There's a gradational increase in the value of side forces from nethermost bottom to eclipse bottom in software analysis. Maximum Shear force is93.8 KN and Maximum Bending Moment values is79.5 KN, which is acted at to bottom of the structure.

5) Then we're designing only G 8 where there's no necessity of considering the wind cargo. The perpendicular cargo consists of dead cargo of structural factors similar as ray, column, cross be asset. And live cargo by using the law IS – 875(Part 1 and Part 2). The structure is designed as a two dimensional perpendicular frame and anatomized for the maximum bending moments and shear force as per IS456-2000. The E Tabs software is used for analysis. Planning, analysis and design of G 8multi-storey Apartment structure was done. The analysis was done according to standard specifications using ETABS for different loads. The confines of structural members were specified and dead cargo and live cargo were applied. This design is done with the intention of gaining holistic knowledge of analysis and design. The analysis and design was done grounded on IS 875 – 1987 and IS456-2000 recommendations.

6) Structural are design to repel earthquake, wind cargo and stable the structure and the damage in the structure causes loss of peoples and the high rise structures and to check the strength Stiffness and resists the relegation of the structure by proper designs and detail ductile of the structure and c a n design the proper graveness loads and depend on the design of the structure, the paper deals the analysis, design is done by using the software package called as E-TABS. The structure is a design grounded on the E-TABS, and the proposition of Limit State Method which provides acceptable strength, utility, and continuity besides the frugality. The relegation, shear force, bending moment variation has been shown. However, the confines of the ray and column should be changed and underpinning detailing can be produced if any ray fails.

7) Flat arbor structures are corroborated concrete structures in which columns are directly supported on the roof arbor without shafts is known as Flat Arbor. Flat arbor consists of Column drop, Column head, and Middle strip. Flat arbor structures are used in places like promenades, theaters, caffs and numerous other marketable structures. Still numerous advantages of the flat arbor are that it consumes lower construction time, reduces the bottom to bottom height, easier form work and hence the flat arbor is used in domestic structure, auto parking and other structures. There's maximum storey relegation at roof position compared to the ground position. The structure relegation of the conventional arbor structure is comparatively lower than the flat arbor structure. Hence the storey relegation in this analysis is lesser by the flat arbor structure compared to conventional arbor.

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8) A flat arbor is a two- way corroborated concrete arbor that generally doesn't have shafts and crossbars, and the loads are transferred directly to the supporting concrete columns. They're subordinated to both perpendicular and side loads. Side loads due to wind and earthquake governs the design rather than the perpendicular loads. The structures designed for perpendicular cargo may not have the capacity to repel the side loads. The side loads are the premier bones because in discrepancy to perpendicular cargo that may be assumed to increase linearly with height; side loads are relatively variable and increase fleetly with height. Flat plate/ arbor can be designed and erected either by conventional corroborated concrete. Or post tensioning. Still, due to issues mentioned over with post- attaching construction in India and its advanced cost, conventional corroborated concrete design should be the favored choice for spans up to 10 measures.

9) In the general construction system during the design and construction of any structure to support crossbeams with shafts and support shafts with columns. This can be called a ray- arbor construction where the ray transfers the entire cargo of the structure above the columns and also the columns at the base. The provision of shafts reduces the clear net height available. So in storages, services and public halls the shafts are occasionally avoided and the crossbeams are directly supported by columns. This type of construction is seductive and beautiful. Relegation of artificial and marketable structures constructed using the flat arbor system is further than the conventional arbor system. Then we can say that a flat arbor with a shear wall gives better relegation resistance. With the increase in height of structure relegation it also goes on adding. Story shear of Flat arbor structure is lower than conventional arbor structure in Y- direction.

10) Flat arbor is a system of construction in which arbor is directly rested on the column. The arbor directly rests on the column and cargo from the arbor is directly transferred to the columns and also to the foundation. To support heavy loads, the consistence of arbor near the support is increased and these are called drops and columns are generally handed with enlarged heads called column heads or capitals. These adding consistence of flat arbor in the region supporting columns give acceptable strength in shear and to increase the quantum border of the critical section, for shear and hence, adding the capacity of the arbor for defying two- way shear and to reduce negative bending moment at the support. Flat arbor structure is preferred over conventional structure in construction due to their advantages in reducing storey height and construction period as compared with conventional structure leading to reduction of construction costs.

III. METHODOLOGY

G+4 Building Model is Consider for the analysis

1) Modeling

G+4) Residential building.

2) Loads

1.5(Live Load +Dead Load).

3) Analysis

Analysis of RCC framed structure.
Shear Force and Bending Moment Calculation

4) Design

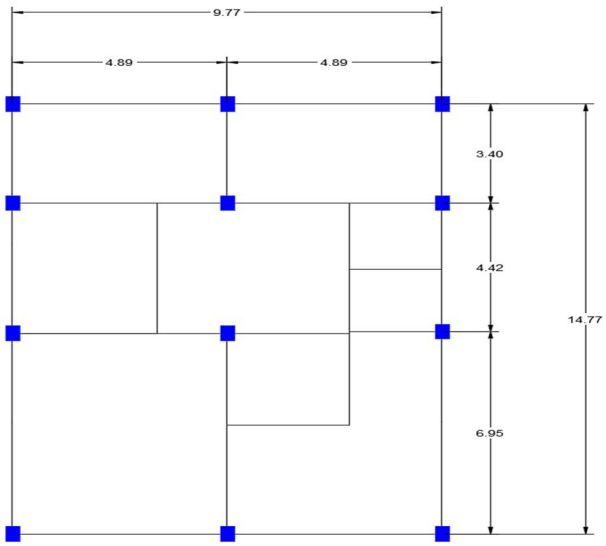
Design of Slab, Beam, Column,

5) Geometric Parameters

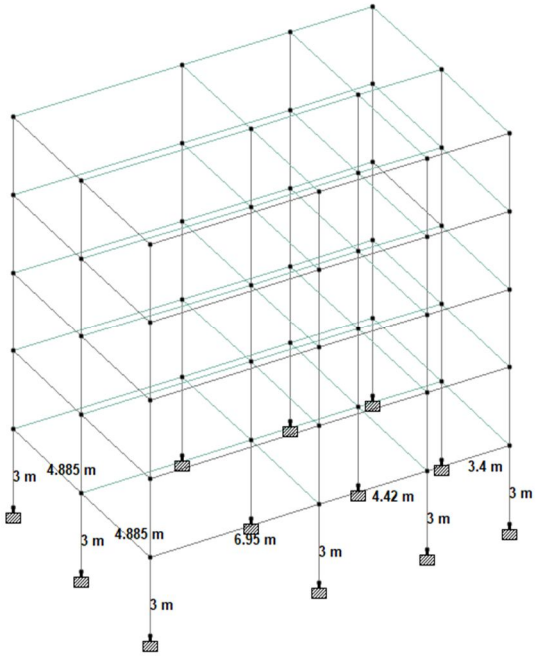
Beam = 300 x 400 M20 – Primary Beams
Column = 300x500 M20 – Column
Slab = 150mm M20

A. Model Information Considered

Height - 15m
Type - Residential Building
Floors - G+4 Story



Center line plan with positioning of column



Residential building G+4 structural plan

B. Calculation of Loads

1) *Main Wall Load:* (Commencing above plinth area to below the Roof) should be the area of the cross sectional wall multiplied by unit weight of the Masonry. (Unit weight of is masonry taken as 21.2 kN/m2). Usually understanding the concept of the plinth load to the IS-code is supposed to be partially of the main wall load. Internal plinth load should be half of the plinth load.
2) *Floor Finish Load:* Floor load is a live load acting on the floor in a building, which is taken as1 kN/m2.
3) *Live Load:* Live load is functional all over the burnt brick masonry structure with the exception of plinth. Usually Live load varies according to the types of structure. For commercial buildings like hotels the live load can be taken directly from IS875:1987(part 2)

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C. Properties Of Members

❖ MATERIALS USED:
- o Grade of Concrete = M25 For All Members.
- o Grade of Steel = Fe 415 For All Member

❖ FRAME SECTIONS PROVIDED:
- o 300x400 M20 – Primary Beams
- o 300x500 M20 – Column (300 x 500 mm, From 1st to 4th floor)

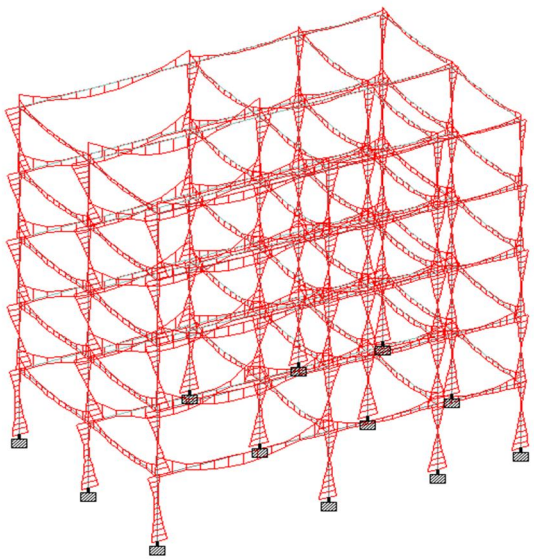
❖ SLAB SECTIONS PROVIDED:
- o S125 M20 – General Slab & WC Slab
- o ST200 M20 – Staircase

❖ WALL SECTIONS PROVIDED:
- o SW250 M20 – Shear Wall (250 mm)

❖ Frame Loads:

1. Main wall 230 mm thick:
= {2.9 m (floor height) – 0.5 m (Depth of Beam)} x 10 m³ (Density of ACC Block) x 0.23 m (Thickness of wall) = 5.52 kN/m ≈ 5.7 kN/m (Applied)
2. Partition wall 115 mm thick:
= {2.9 m (floor height) – 0.3 m (Depth of Beam)} x 10 m³ (Density of ACC Block) x 0.115 m (Thickness of wall) = 2.99 kN/m ≈ 3 kN/m (Applied)
3. Terrace to OHT wall of 2.5 m height:
= {2.5 m (floor height) – 0.5 m (Depth of Beam)} x 10 m³ (Density of ACC Block) x 0.115 m (Thickness of wall) = 2.3 kN/m ≈ 2.5 kN/m (Applied)
4. Parapet wall & Railing = 1.5 kN/m (Applied)

D. BMD (Bending Moment Diagram)



Bending moment diagram for G+4 residential building

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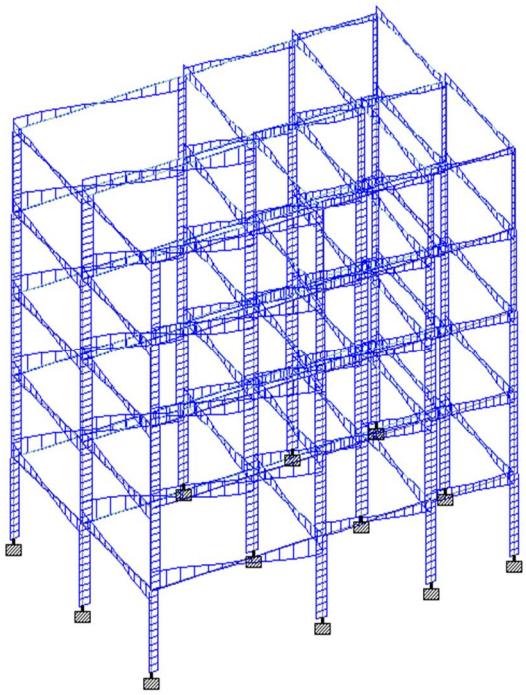
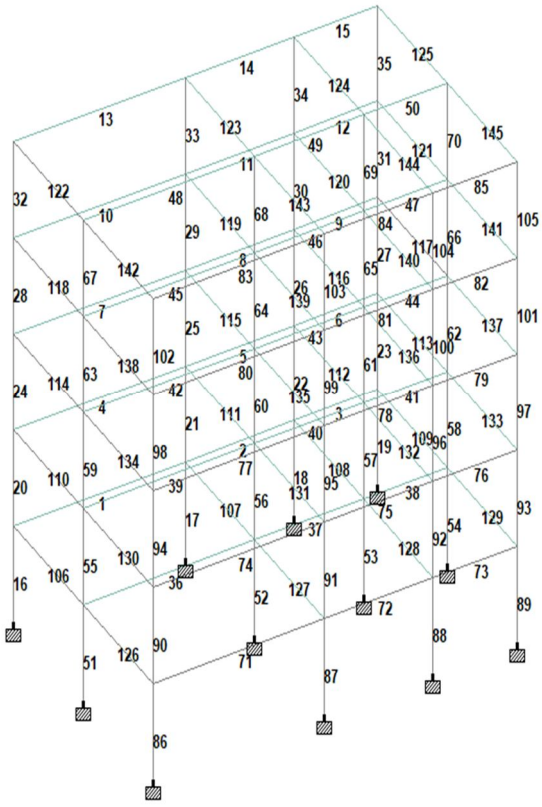
E. Shear Force Diagram (SFD)



F. Reaction



Column	X KN	Y KN	Z KN	MX KN/M	MY KN/M	MZ KN/M
16	-9.493	-19.543	-0.593	-0.588	-0.009	19.917
51	-10.632	-27.024	-0.00	0.000	0.000	21.050
86	-9.493	-19.543	0.593	-0.588	0.009	19.917
17	-13.017	-13.522	-0.060	-0.062	0.001	23.405
52	-14.527	-14.527	0.00	0.000	0.00	24.896
87	-13.017	-13.522	0.060	0.060	-0.001	23.405
18	-14.166	-21.720	-0.283	-0.273	0.004	24.491
53	-15.444	-25.449	0.00	0.00	-0.00	25.804
88	-14.116	-21.720	0.283	0.273	-0.004	24.491
19	-11.106	54.898	0.935	0.916	-0.008	21.516
54	-12.129	66.581	0.000	0.000	-0.000	22.533
89	-11.106	54.898	-0.935	-0.916	0.008	21.516

IV.CONCLUSION

The literature Review analysis the Effective use of STAAD Pro for the Analysis and Design of Building Structure of (G+$) Model is analyses which gives effective value of BM/SM at various

Locations. These value are Utilized for the design of various member. Staad.pro gives results which are almost accurate and economical when compared.

To manual calculation. Also, we conclude that the more advanced technologies we have, the more knowledge we gain for better work.

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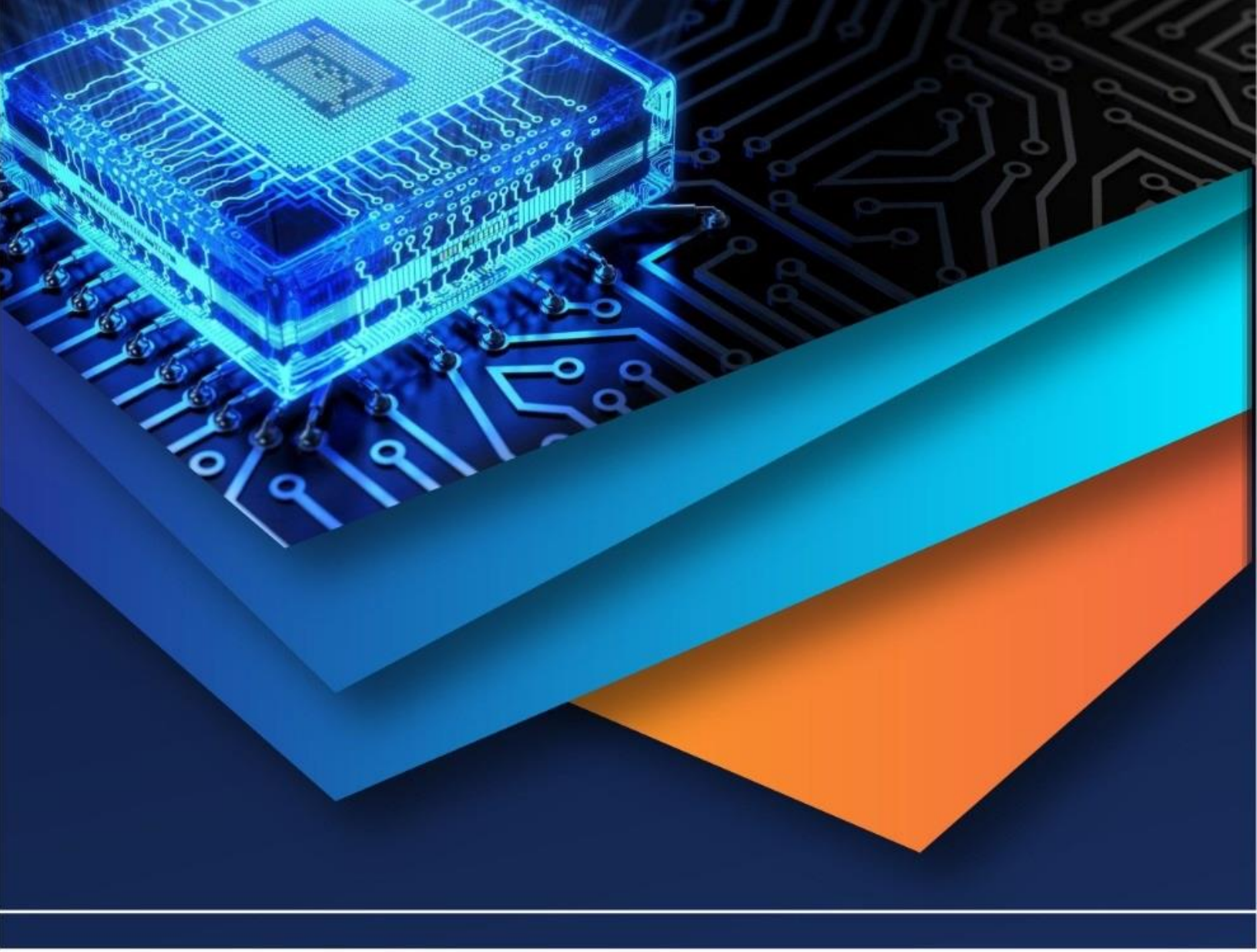

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