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Mivan Formwork a New Emerging Construction Method: A Review

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Abstract: *Rapid urbanization and the increasing demand for affordable housing have compelled the global construction sector to shift from conventional masonry and formwork practices toward faster and more industrialized construction methodologies. This review paper presents a comprehensive evaluation of Mivan technology, an advanced aluminium formwork system developed for the construction of monolithic reinforced-concrete structures. By synthesizing findings from academic literature and industry case studies, this study examines the structural, economic, and operational implications of transitioning from conventional timber or steel formwork to modular aluminium formwork systems. The analysis indicates that Mivan construction can significantly reduce project durations, while providing superior dimensional accuracy and a high-quality concrete surface finish.*

The resulting finish can substantially reduce or eliminate the requirement for conventional external plastering, thereby lowering labour requirements and associated construction costs. Furthermore, the monolithic integration of reinforced-concrete walls and slabs improves structural continuity and can provide enhanced resistance to lateral and seismic forces when appropriately designed and detailed. The system also offers advantages in terms of reduced construction joints and improved water-tightness, making it particularly suitable for high-rise and mid-rise residential buildings where repetitive floor layouts and rapid construction are required.

The structural performance of Mivan based buildings is evaluated considering relevant gravity and lateral load effects, including dead load, live load, wind load, and seismic load combinations, in accordance with applicable Indian Standards, including IS 875 (Parts 1, 2, and 3) and IS 1893 (Part 1). Aluminium formwork technology as an efficient and structurally integrated construction methodology for meeting the growing demand for rapid, durable, and economical residential development.

Keywords: *Mivan System, Conventional Formwork, ETABS Software.*

I. INTRODUCTION

Mivan is an aluminium formwork system used for the rapid construction of monolithic reinforced-concrete structures. The system was developed in Europe and later commercialized and manufactured on a large scale by the Mivan Company in Malaysia during the 1990s, from which the technology acquired the name “Mivan.” The system has subsequently gained widespread application in several regions, including Europe, the Gulf countries, and Asia, particularly for mass residential and high-rise construction. The rapid growth of urban populations, increasing demand for housing, and limited availability of land have created a need for faster, more economical, and reliable construction methods. In large-scale housing projects, conventional construction techniques may require considerable time and labour, particularly when masonry, plastering, and repetitive formwork operations are involved. Therefore, the adoption of modern industrialized construction technologies has become increasingly important for achieving shorter construction schedules while maintaining structural quality and durability.

Mivan aluminium formwork technology is particularly suitable for mass housing and repetitive building layouts, where a large number of dwelling units can be constructed within a relatively short period. The system consists of lightweight, modular aluminium panels that can be assembled, aligned, and subsequently dismantled with comparatively high efficiency. Its repetitive use enables greater standardization and dimensional accuracy in the construction of walls, slabs, beams, and other structural components.

II. LITERATURE REVIEW

This section synthesizes previous findings concerning innovative construction practices and details their performance relative to standard traditional options.

D.M. Wijesekara “Cost Effective and Speedy Construction for High-Rise Buildings in Sri Lanka by Using Aluminium Panel System Formworks (2012)”, is concluded if worth of construction project can be controlled when building has less than 10 typical no. of storey. Also say that when construction activity can be represents material is unique which depend on the design of structure but the labour requirement and duration of the project are wholly depend on the modern technology and also represent that the both formwork is model for G+3, G+6, G+9 is analysis and design as per IS code. Linear and Non-linear consequence compared to gravity loading and inelastic seismic loading with soil flexible support. The result is remarked that Mivan structure gives better earthquake performance than the conventional structure.

Ganar A.S., Patil S. D. “Comparative analysis on cost and duration of MIVAN formwork building and Conventional Formwork building (2015)”, The present study focuses on the comparative analysis of construction cost and duration between a conventional formwork building and a MIVAN formwork building. Both buildings are considered as G+12 storey structures, with a total floor area of 771.92 m² and a floor-to-floor height of 2.95 m. The study considers the use of conventional formwork for one building and MIVAN aluminium formwork for the other. The main objective of the study is to determine the differences in quantity, construction cost and construction duration associated with the two formwork systems. Quantity estimation is carried out for the major construction components, including concrete, reinforcement and formwork. Based on the calculated quantities, the cost of construction associated with each formwork system is determined. The floor-cycle duration of the conventional formwork building is compared with that of the MIVAN formwork building to determine the potential time savings achieved through the use of aluminium formwork.

Prathul U, Leeladhar Pammar, “Analysis of Productivity by Comparing Mivan and Conventional Formwork (2015)”, Productivity is an important factor influencing the overall efficiency and performance of a construction project. At the construction-site level, productivity can be assessed across various activities, such as concrete work, reinforcement steel work, and formwork. The primary objective of this study is to evaluate and compare the productivity of conventional formwork and Mivan formwork systems. The study demonstrates that Mivan formwork provides higher productivity compared with conventional formwork, particularly in repetitive construction activities. Furthermore, its faster execution and systematic installation make it an economical and efficient formwork solution for projects involving repetitive structural elements.

Sajeet.S.B., Supreeth S Gowda, “Earth Quake Response of different shapes of Mivan Wall Tall Buildings (2015)” In the present study, different configurations of Mivan wall buildings with irregular geometries are analyzed using the Response Spectrum Method which focuses on evaluating the contribution of different Mivan wall configurations to the lateral strength and lateral stiffness of high-rise buildings under seismic loading. Furthermore, a comparative analysis is carried out among the various building configurations to assess their relative structural performance. The comparison considers key parameters such as lateral displacement, storey drift, base shear, and overall structural response. The objective is to identify the influence of building shape and Mivan wall configuration on the seismic performance of high-rise structures and to determine the configuration that provides a more effective response to lateral loads.

Anagha M and Anoop P P, “Earthquake Response of Different Shapes of Tall Vertically Irregular Mivan Wall Building (2016)”, research paper focuses to check the reduction of seismic response for different shapes. L shape, O shape and H shape for ten storey’s conventional and Mivan wall building having stiffness and mass irregularity were analyzed by Response Spectrum Method using ETABV.9.7.1 software. Structures with 40 x 24m arrangement aspect and story number ten are made by utilizing ETAB V.9.7.1 programming. Then, at that point, they are changed to get L, H and O shape the Vertical way. The underlying models have a similar story stature of 3m.

Hemendrasinh Chauhan, Dr. K B.Parikh, “Comparison and Effectiveness of Mivan formwork over the Conventional formwork (2017)”, which is an aluminium formwork system designed for rapid and repetitive construction. It enables the walls, slabs, and other structural components to be cast with a high degree of accuracy, and in many applications, walls and slabs can be concreted in a single operation or closely integrated sequence. Mivan formwork is relatively lightweight compared with many conventional systems, making it easier to handle, assemble, and dismantle. It also provides a uniform concrete finish and can reduce construction time and labour requirements when used effectively.

This paper presents a comparative study of Mivan formwork and conventional formwork, focusing on parameters such as construction time, quality, cost, labour requirements, handling, reusability, and safety. The study aims to evaluate the advantages and limitations of Mivan formwork and its suitability for modern building construction.

Pawan M. Walvekar, “Seismic Performance Evaluation of Mivan Structural System v/s Conventional Structural System with Effect of SSI by Pushover Analysis (2017)”, An existing study investigated the nonlinear performance and structural behaviour of Mivan structures in comparison with conventional RC structures. Both types of structures were modelled using identical material properties, loading conditions, plan configurations, and elevation characteristics to ensure a consistent basis for comparison. Structural models with G+3, G+6, and G+9 storeys were developed and analyzed and designed in accordance with the relevant IS codes. The study evaluated both linear and nonlinear structural responses under gravity loading and inelastic seismic loading conditions. Soil–structure interaction was also considered by incorporating flexible support conditions in the analytical models. The results obtained from the different structural configurations were compared to assess their relative performance under both gravity and seismic actions. The findings indicated that Mivan structures exhibited better overall seismic performance than conventional structures under the investigated loading conditions.

Bhanulatha G. N. et al “Study of Dynamic Behaviour of MIVAN Structure with Different Percentage of Openings and Different Seismic Zones (2017)” conducted a detailed investigation into the structural behaviour of Mivan buildings with and without openings. The study considered a 10-storey Mivan building and evaluated its structural response for different percentages of wall openings of 20%, 40%, and 60%, along with a model without openings. A Response Spectrum Method was adopted for the linear dynamic analysis, and the structural analysis was performed using ETABS. The study focused on evaluating the effect of different opening percentages on the overall structural behaviour of the Mivan building.

Hemanthkumar M S and Kiran. T, “Analysis of Wind Response on Different Shapes of High-Rise Mivan Wall Buildings by Using Gust Factor Method (2017)”, research focused on the wind produced response of the high rise building by taking G+20 Storey building. The structure under study is a Mivan structure wherein which the slab wall system is adopted in place of the moment resting frame for the building. This review focuses on flat abnormalities by taking into account various shapes in the arrangement of the design. The destinations of the exploration were to concentrate on the Dynamic Wind reaction of skyscraper unpredictable Mivan divider working by Gust factor strategy for wind investigation and relate the Gust Wind reaction of various states of High ascent sporadic Mivan divider building. The designing and analysis of the model was done using analytical application ETABS.

Sreenath. V, B. Prakash Rao et. al “Suitability of modular Aluminium formwork in RCC Framed Structures (2018)”, This paper defines in brief, the need of Modular Aluminium Formwork in the Indian construction industry. The study is conducted on a project in Bangalore, Karnataka, India namely Salarpuria Sattva Divinity which comprises of a commercial (2B+G+5) and ten residential towers (G+21). The paper analyses the suitability of Modular Aluminium Formwork technology in a framed structure by considering the quality, speed of construction, labour requirement, cost of construction and other related factors. The same typical floor plan was also prepared in a complete Mivan design, for comparison. The estimation of cost for one floor of all the three structures using these three different formworks were prepared. The construction using Mivan technology seemed to be the most economical in the long run considering the number of repetitions possible with the formwork. The Modular Aluminium formwork construction was found to be as expensive as that of using conventional formwork for the RCC framed structure, considering only the initial costs (Maintenance and finishing costs are not considered). But the quality obtained with the use of Modular Aluminium formwork, the stability due to monolithic construction, the increased carpet area and the speed of construction makes the technology more economic than the conventional technology.

Anuj Choubey, Savita Maru [2020] “Optimum Shape for High Rise MIVAN and Conventional Structure in Seismic Loading (2020)”, This paper aims to highlight the potential of MIVAN technology in constructing super high-rise buildings. Specifically, it investigates the seismic response of high-rise building with different shapes, such as rectangle shape, C shape L shape and I Shape. The analysis employs the Response Spectrum Method using ETABS software to assess the seismic performances of these structures. Through such technologically innovative, there is a hope to overcome housing challenges and provide sustainable housing solutions for the growing population.

Aarti Nanasahab Kote and Aahuti Ramesh Nandeshwar, “Duration Comparison of Mivan Formwork over the Conventional Formwork (2020)”, research introduced cost examination of mivan innovation with ordinary development innovation. The innovation of Mivan was totally fine with cost, quality and efficient as contrast with regular. Contrasted with the ordinary technique, development costs with MIVAN formwork are ascending by Approximately 25-30 percent. Construction cost for every individual. Sq.ft in MIVAN is pretty much as high as 33% contrasted with the regular method. The per distinction. Sq.ft development cost increments by right around 392 Rs/Sq.ft in MIVAN. The term of development in MIVAN is not exactly the regular technique by Almost 25% and 534 days, for example 1.5 years.

Anantkumar M. Patil, Vishwanath Awati, Rashmi J. V. “Comparative Analysis of Conventional Formwork and Mivan Formwork based on Duration and Cost (2020)”, Mivan formwork is an innovative construction technique that can be used as an alternative to conventional formwork methods. It facilitates the timely completion of construction projects while potentially reducing overall project costs. The present study focuses on a comparative analysis of the cost and duration of construction using conventional formwork and Mivan formwork. The analysis is carried out using Microsoft Project to plan, schedule, and compare the activities involved in both construction methods. The study aims to evaluate the effectiveness of Mivan formwork in terms of construction time and cost and to determine its suitability for achieving efficient project completion within the stipulated time and budget.

Abhijit V Bidare and Deepali Bhagaje, “Comparative Analysis of Conventional Technology and Mivan Technology (2021)”, The primary objective of this research was to evaluate and compare the performance of conventional reinforced concrete (RC) structures and Mivan formwork structures under earthquake loading. The study also investigated the structural behaviour of both conventional and Mivan construction systems. A comparative analysis was carried out based on the quantity of materials required for each structural system and their relative performance with respect to key seismic parameters, including base shear, natural frequency, time period, storey drift, storey shear, and storey stiffness. Using ETABS 2013 a linear dynamic analysis was conducted to evaluate the overall seismic performance of the structures. Structural modelling was carried out for a 15-storey RC building and a corresponding Mivan building, and their performances were investigated under different seismic zones. The results were used to assess the relative effectiveness and structural response of conventional and Mivan construction systems under earthquake loading.

Pratik Prakash Ramteke, Rachana Dhoke et. al “To Analyzed the Building by Mivan Technology (2022)” The analysis indicates that buildings constructed using Mivan formwork technology are approximately 0.132% more expensive than those constructed using conventional formwork. However, Mivan technology offers a significant advantage in terms of construction time, particularly for high-rise structures, where the construction duration can be reduced to nearly half compared with conventional methods. The use of Mivan formwork enables the monolithic casting of structural components in a single operation, which contributes to faster construction and improved structural continuity. The technology also provides several other benefits, including better and more consistent construction quality, improved material durability, reduced formwork maintenance, lower repetitive labour requirements, and faster completion of construction activities. Therefore, although the initial construction cost may be marginally higher, Mivan technology can provide substantial time savings and operational advantages in large-scale and high-rise building projects.

Nisarga K, Madhukaran, “Structural Performance of Mivan Structural System Over Conventional Structural System (2022)”, In recent years, significant advancements have taken place in construction processes and technologies. In ancient times, buildings were primarily constructed using load-bearing structural systems. With the development of reinforced cement concrete (RCC), the RCC framed structural system was introduced and became widely adopted in modern construction. At present, reinforced concrete (RC) structural wall systems are increasingly being used, particularly in high-rise and mass housing projects. Aluminium formwork, commonly known as Mivan technology, represents a further advancement in modern construction practices. This technology utilizes an RC structural wall system, commonly referred to as a shear wall system, to construct the building as an integrated structural unit. Mivan formwork is primarily designed to facilitate rapid and repetitive construction while providing greater dimensional accuracy, structural strength, and uniformity. The use of lightweight aluminium panels allows walls, slabs, beams, and other structural components to be cast together, thereby reducing construction time and improving overall construction efficiency.

Jatin Kushwaha, Pradeep Kumar Nirmal, Lokesh Singh [2022] “Analysis of a Tall Structure Considering Mivan Technology Under Lateral Load Using ETABS - A Review” High-rise structures are designed to resist seismic loads; however, due to their considerable height and structural characteristics, they are also subjected to significant wind loads. The magnitude and dynamic nature of wind

loading make it essential to evaluate its effects on the structural behaviour of high-rise buildings. This research primarily focuses on investigating the wind-induced response of a G+15 high-rise structure. A Mivan construction system is considered in the study, employing a slab-wall structural system instead of a conventional moment-resisting frame. The study further investigates the effect of plan irregularities by considering different building shapes and configurations. The structural response of these configurations under wind loading is analysed to understand the influence of building geometry on the overall wind-induced behaviour of the structure.

Mr. Nikhil S. Thote, Prof. Aditi H. Deshmukh [2022] “Analysis of Framed Structure vs Mivan Structure (2022)”, The study investigates the comparative performance of G+9 residential framed and Mivan buildings using linear static analysis. ETABS 2016 was employed for the modelling, analysis, and design of the structures. The structural members were designed and analyzed in accordance with IS 456:2000 and IS 1893:2002 (Part 1). The analysis was carried out for Seismic Zone III considering medium soil conditions. The performance of the framed and Mivan structures was compared based on important parameters such as fundamental time period, maximum lateral displacement, and storey drift. The study provides a comparative assessment of the seismic response of conventional framed construction and Mivan formwork construction.

Nitesh Baban Patekar, A. F. Shaikh “Assessing the impact of conventional formwork and Mivan formwork on construction productivity and efficiency (2023)”, This research project centers on evaluating the use of conventional formwork and Mivan formwork in construction projects, aiming to improve construction productivity and efficiency. The primary objective is to compare the time and cost requirements of these two formwork systems to assess their impact on project outcomes. The study employs a mixed methods approach, combining quantitative and qualitative analyses. Data is collected from construction projects that have employed both formwork systems, and key performance indicators such as project duration, labour productivity, material consumption, and costs are examined and compared. The findings will provide valuable insights into the advantages and limitations of conventional formwork and Mivan formwork. The analysis will identify the factors that influence productivity and efficiency in each system and highlight areas for potential improvement. The ultimate aim of this study is to provide guidance to construction professionals in making informed decisions regarding the selection of formwork systems, taking into account factors such as cost, time, labour requirements, and quality. Additionally, the research will contribute to the existing knowledge base on construction productivity and efficiency, offering recommendations to enhance project outcomes. By identifying the strengths and weaknesses of conventional formwork and Mivan formwork, this study seeks to drive advancements in construction practices and contribute to overall industry improvement.

Yogesh Radheshyam Jangid et. al “Mivan Formwork in Construction (2023)”, Construction is a significant sector of the Indian economy and plays a vital role in the country's infrastructure and housing development. With India's rapidly increasing population, the demand for affordable and adequate housing has grown considerably. To meet this growing housing requirement within a limited time frame, various modern construction technologies are being developed and adopted. Among these, the Mivan formwork system has emerged as an efficient and widely used technique, particularly for large-scale residential projects. This innovative formwork system is well suited for constructing a large number of housing units at a faster rate while maintaining uniformity, dimensional accuracy, and quality. Its ability to facilitate repetitive construction and reduce overall construction time makes it a suitable technology for meeting the increasing demand for housing in India.

Vedika Prasad Mahale et.al “Optimizing Construction Efficiency with Mivan Formwork System (2024)”, Mivan technology, also known as Aluminum Formwork System, is a modern construction technique that utilizes Al formworks to create cast-in-place concrete structures efficiently. This method replaces traditional formwork made of wood or steel with lightweight and reusable Al panels, resulting in faster construction cycles, improved quality, and cost-effectiveness. Mivan technology is widely used in residential, commercial buildings.

Prof. Mrs. Poorva Ziradkar, Mr. Ajinkya Shinde et. al “Use of Mivan Formwork in RCC G+12 Building (2025)”, Formwork is one of the most important aspects of the construction industry, as it plays a significant role in determining the speed, quality, and efficiency of construction. With the advancement of formwork technology, the construction industry has experienced improvements in construction speed and productivity, which can ultimately contribute to economic benefits. As the global population continues to increase, the demand for residential buildings and infrastructure is also rising. Meeting this demand within a limited time frame is a

major challenge for the construction industry. Therefore, modern construction techniques that can reduce construction time while maintaining quality have become increasingly important. One such technique is the Mivan formwork system, which has gained considerable attention in recent years, particularly in mass housing projects. The system enables faster construction through the use of aluminium formwork, allowing repetitive building components to be constructed efficiently and with greater consistency.

Prajwal M L, Dr M Keshava Murthy, “Comparative Seismic Analysis of Multistorey Mivan Structures Over Conventional RC Structures, (2025)”, The seismic analysis carried out in this study considers G+10, G+15, and G+20 storey buildings constructed using both conventional reinforced concrete (RC) and MIVAN formwork systems. The seismic performance of the conventional RC and MIVAN structures is evaluated using two analytical approaches: the Equivalent Static Method and the Response Spectrum Method. The structural models are developed and analyzed using ETABS 2020 software, considering Seismic Zone V and medium soil conditions (Type II) in accordance with IS 1893:2016. The performance of the buildings is assessed primarily in terms of storey displacement and storey shear. The study aims to compare the seismic response of conventional RC and MIVAN structures for different building heights. Furthermore, the results obtained from the Equivalent Static and Response Spectrum analyses are compared in both the longitudinal and transverse directions to evaluate differences in structural behavior and seismic performance.

Anmol Hinduja, Tarun Sankle, Mahroof Ahmed, “Comparative Study of Mivan Technology and Conventional RCC Structures in High Seismic Zones, (2025)” This research presents a comparative study of MIVAN formwork technology and conventional RCC systems. A G+12 residential building model was developed and analyzed under seismic and wind loading conditions using advanced structural analysis software. The structural performance of both systems was evaluated based on storey displacement, inter-storey drift, base shear, and natural time period. The results indicate that MIVAN structures, owing to their monolithic construction and reduced number of structural joints, exhibit improved performance under lateral loading compared with conventional RCC structures. The MIVAN system demonstrates lower storey displacement and inter-storey drift, indicating enhanced lateral stiffness and improved seismic response. Also MIVAN technology offers faster construction, better dimensional accuracy, and reduced labour requirements, making it particularly suitable for large-scale mass housing projects in seismic regions.

III. CONCLUSION

Based on the findings reported in the reviewed literature, Mivan construction generally provides higher construction productivity, improved dimensional accuracy, consistent concrete surface quality, and reduced labour requirements compared with conventional formwork systems. From an economic perspective, most studies show that the initial investment and formwork cost of Mivan systems can be higher than conventional formwork. However, this additional initial cost can potentially be offset by shorter construction schedules, repeated reuse of formwork, reduced labour requirements, lower finishing requirements, and earlier project completion while several researchers have highlighted that Mivan buildings, which generally behave as reinforced-concrete wall or shear-wall systems, possess considerable lateral stiffness and structural continuity. Consequently, Mivan technology should not be considered a universal replacement for conventional construction. Proper structural modelling and design using appropriate load combinations and relevant Indian Standards, including IS 875 for gravity and wind loads and IS 1893 for seismic effects, are essential to ensure safety and serviceability. Overall, the literature establishes that Mivan aluminium formwork is particularly suitable for large-scale, repetitive, and schedule-sensitive residential construction. Further research involving detailed ETABS based comparative analysis, life-cycle cost assessment, sustainability evaluation, and nonlinear seismic performance of Mivan structures would provide a more comprehensive understanding of its long-term structural and economic benefits.

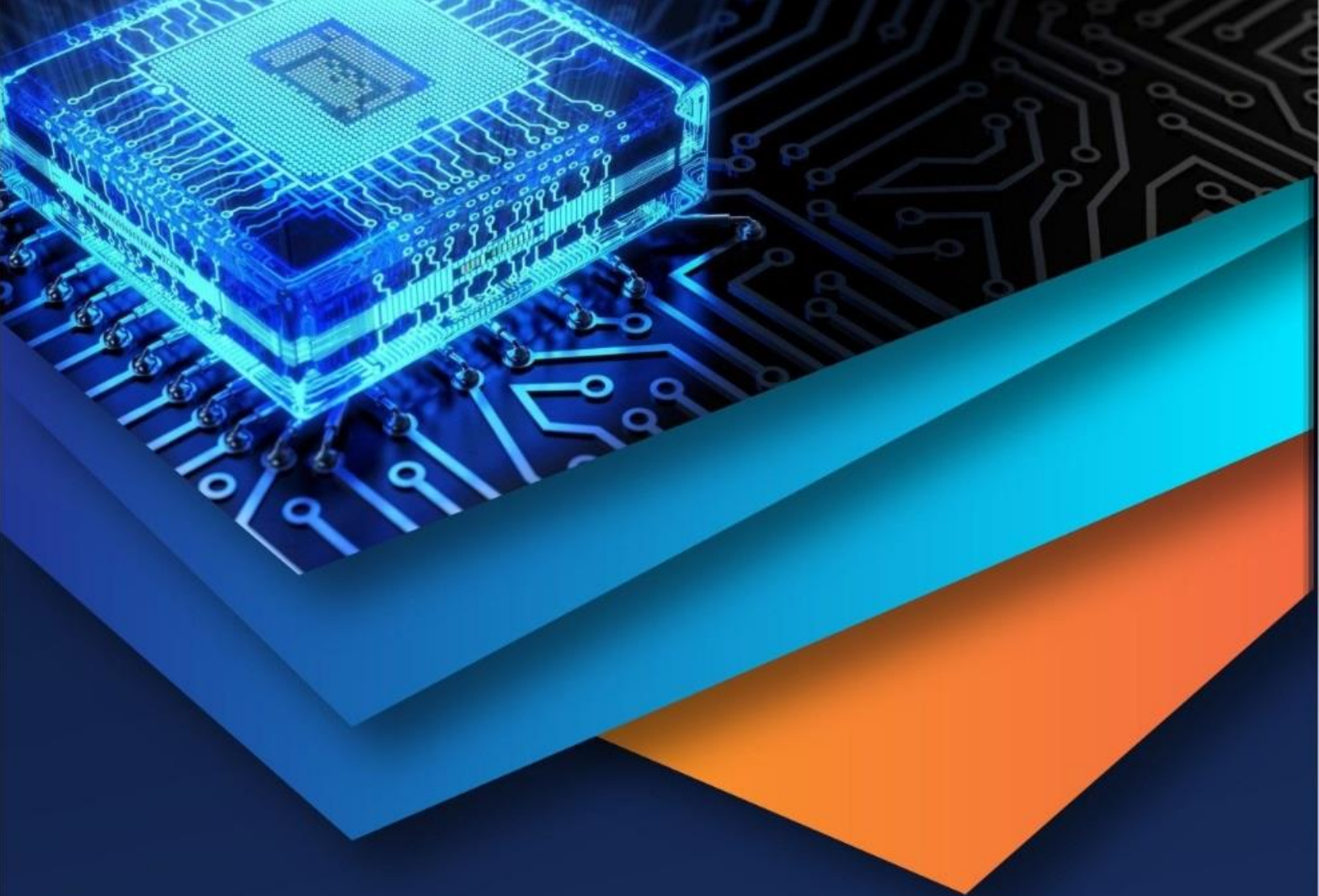
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