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Landslide Hazard Zonation Mapping of Karul Ghat using Geoinformatics

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Abstract: ***The most frequent and widespread damaging landslide in the Karul Ghat are induced by heavy rainfall. The majority of rainfall-induced landslides is deep (more than meters deep) and moves rapidly. Many rainfall-induced landslides transform into debris flows (fast-moving slurries of water, soil and rock) as they travel down steep slopes, especially those that enter stream channels where they may mix with additional water and sediment.***
The present research focus on the detail preparation of hazard zonation map of Karul Ghat. For detailed study, we used SRTM data for preparing digital elevation model (DEM), and geographical information system (GIS) was used in evaluation of linear, areal and relief aspects of morphometric parameters. Slope, hill shade, ordering have prepared using spatial analysis Tools and contour, aspect, have prepared using Surface Tool in QGIS 3.2.3 BONN software. Different thematic maps i.e. drainage density, slope, relief, have prepared by using QGIS software. Based on all that analysis that we prepare hazard zone in that area and prepare well planning. The present study reveals that the study of Karul Ghat which is the mainly hilly area. From this area, NH17 passes. By using Remote Sensing and GIS software we are going to Hazard Zonation Map of Karul Ghat. It is helpful for future planning as well as to prevent loss occurring due to a landslide in that area.
Keywords: Landslide, QGIS, DEM,SRTM,Hazard zonation.

I. INTRODUCTION

Landslide is one of the major natural and geological hazards occurring all over the world every year. In the recent past, various landslide events have taken place in several regions in India. It generates lots of fatalities and financial losses than any other type of natural disasters. About more than 12% of the land area in the country is susceptible to landslide and more than 300 die every year worldwide due to a landslide. With recent developments of satellite image with high resolution, image analysis techniques and geographical information system (GIS) for spatial data analysis, a variety of application using Remote Sensing and GIS as tools are emerging. The Landslide phenomenon is not only limited to land or sliding but it also includes all kind of mass movements towards the slopes under influence of gravity. Due to a sudden landslide on roads transportation and the factors related to it gets badly affected. Nowadays, using Remote Sensing and GIS techniques we can predict the possible areas where landslide may occur in future. Geographic Information System by which we can observe various features of the ground surface. GIS technologies facilitate the management of different typology of analogical data, maintaining a proper cartographic representation and allowing the combination of analogue and vector data in order to create useful hazard management maps. These different information, included in the GIS geodatabase maintain their geometric consistency, allowing rapid query and calculation using the stored data. Karul Ghat starts at Karul Check Post and finishes 800 meter ahead of Kolhapur border in Gaganbawda. The 9 kms portion of this ghat falls in Sindhudurg. Sudden twists and deadly turns in here make journey thrilling and risky at the same time. Sindhudurg and Kolhapur shares good trade relations for which maximum transport takes place through Karul Ghat. Gradually number of heavy vehicles travelling from this route increased and due to lack of restrictions and regulations these vehicles deteriorated corners of high cliffs here. In Karul Ghat, landslides are recurrent phenomena causing victims and significant economic damage to infrastructures, loss of productive soils and pasture lands. Annually, during the rainy seasons. Not less than crores of rupees are spent till date on safety fencing, support walls, parapets etc.The Karul Ghat regions are affected by natural hazards, among which landslides represent the primary cause of death. Landslide inventory maps are prepared for multiple scopes, including: (i) documenting the extent of landslide phenomena in areas ranging from small to large watersheds and from regions to states or nations, (ii) as a preliminary step toward landslide susceptibility, hazard, and risk assessment, (iii) to investigate the distribution, types, and patterns of landslides in relation to morphological and geological characteristics and (iv) to study the evolution of landscapes dominated by mass-wasting processes.
The present study reveals that necessity of landslide hazard zonation mapping with the help of field study as well as remote sensing and GIS.

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II. STUDY AREA

The present study reveals that the study of Karul Ghat which is the mainly hilly area. From this area, NH17 passes. By using Remote Sensing and GIS software we are going to show Hazard Zonation Map of Karul Ghat. It is helpful for future planning as well as to prevent loss occurring due to a landslide in that area.

1) All Study Area : Karul Ghat (Kolhapur district, Maharashtra)
2) Longitude : 73.795 E to 73.837 E
3) Latitude : 16.518N to 16.549 N
4) Area : 9.71Sq.km

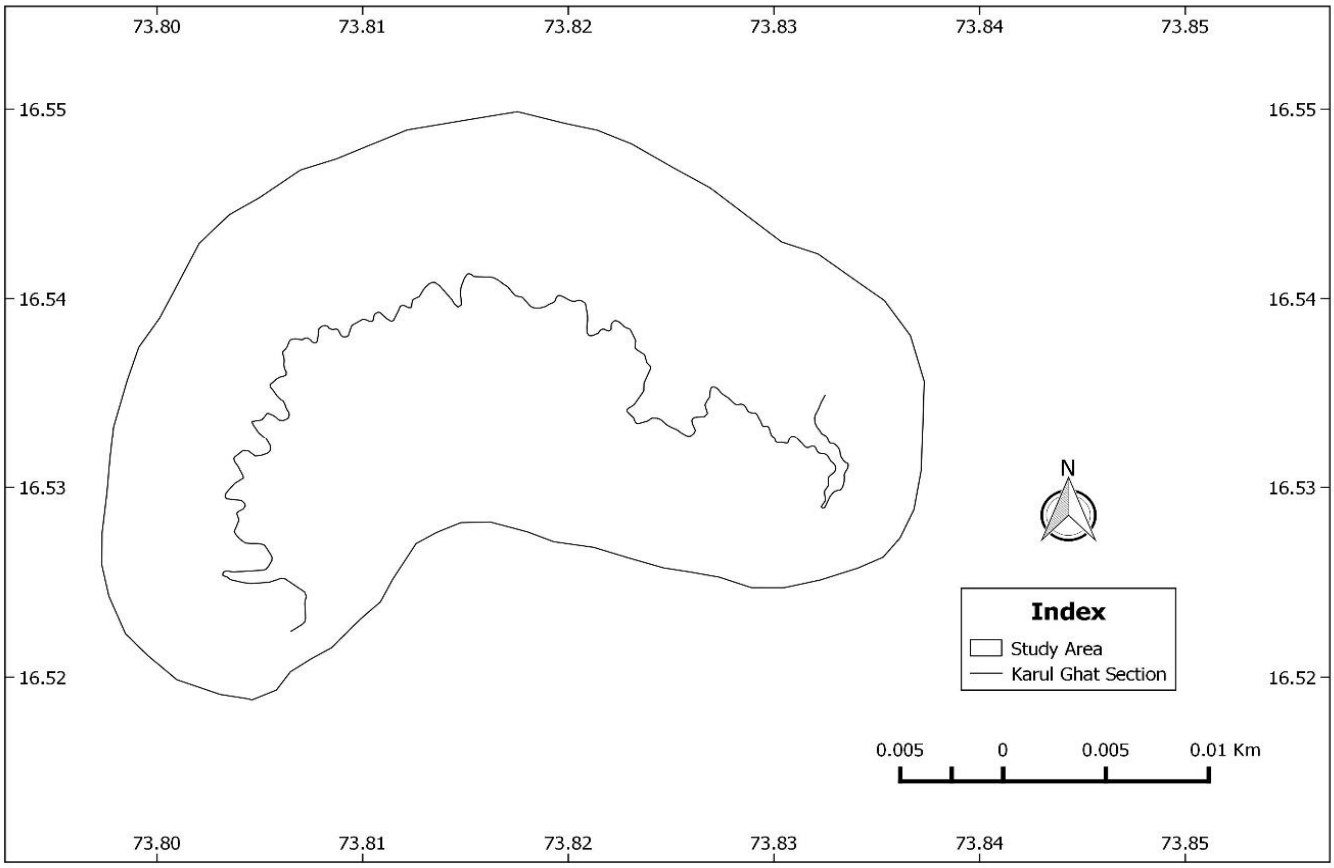


Fig. 1 Study Area

III.METHODOLOGY

A. Study of basic concept of remote sensing and its application.
B. Collect spatial data, digital elevation model from online source.
C. Visit landslide affected area and collect samples.
D. Interpretation of digital maps.
E. Preparation of landslide hazard zonation maps.

IV.RESULTS AND DISCUSSIONS

Slope Map-We prepared slope map of study area in Grass 6.4.4 of QGIS software. Maximum area of karul ghat is covered by very steeply sloping also some area of karul ghat section is coming under the steeply sloping. The along road stretch area of karul ghat is extremely sloping in nature.

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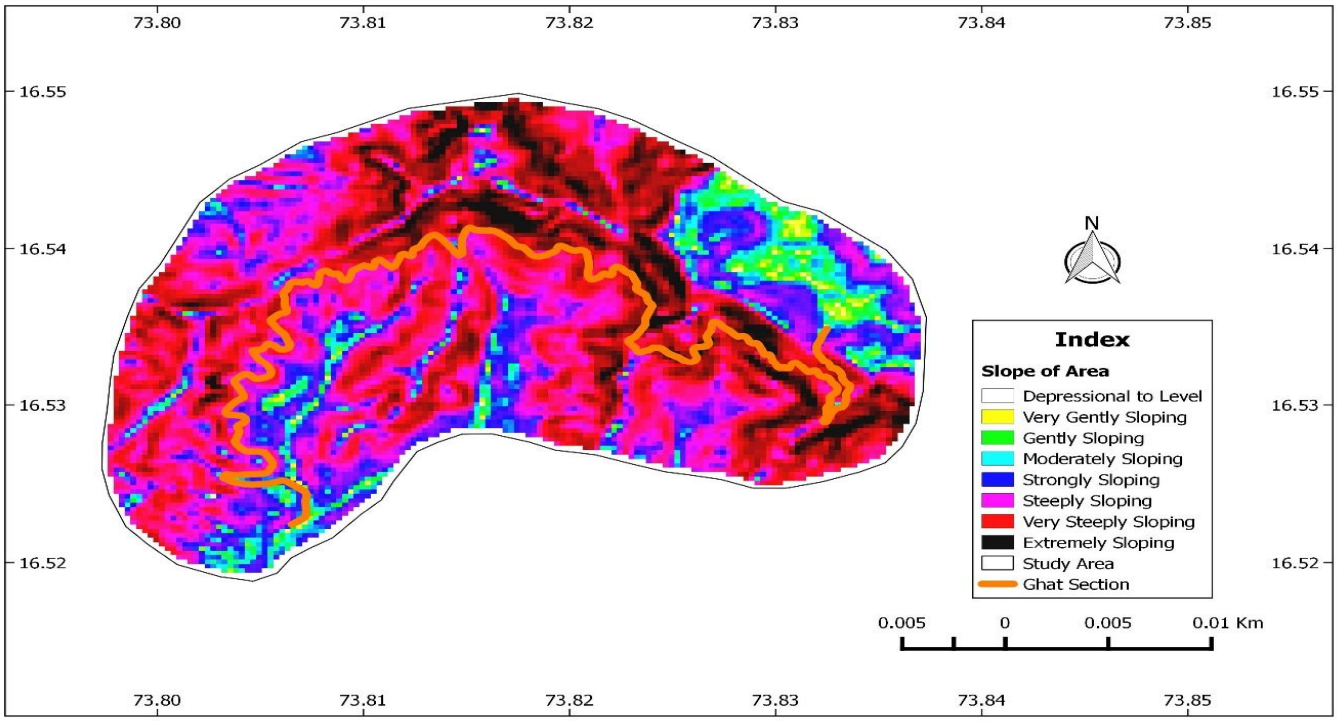


Fig. 2 Slope Map

Contour Map of Study area- We prepared contour map of study area with help of raster analysis of QGIS software. Contour interval of this map is 25m.Highest contour is 675m and lowest contour is 150m.

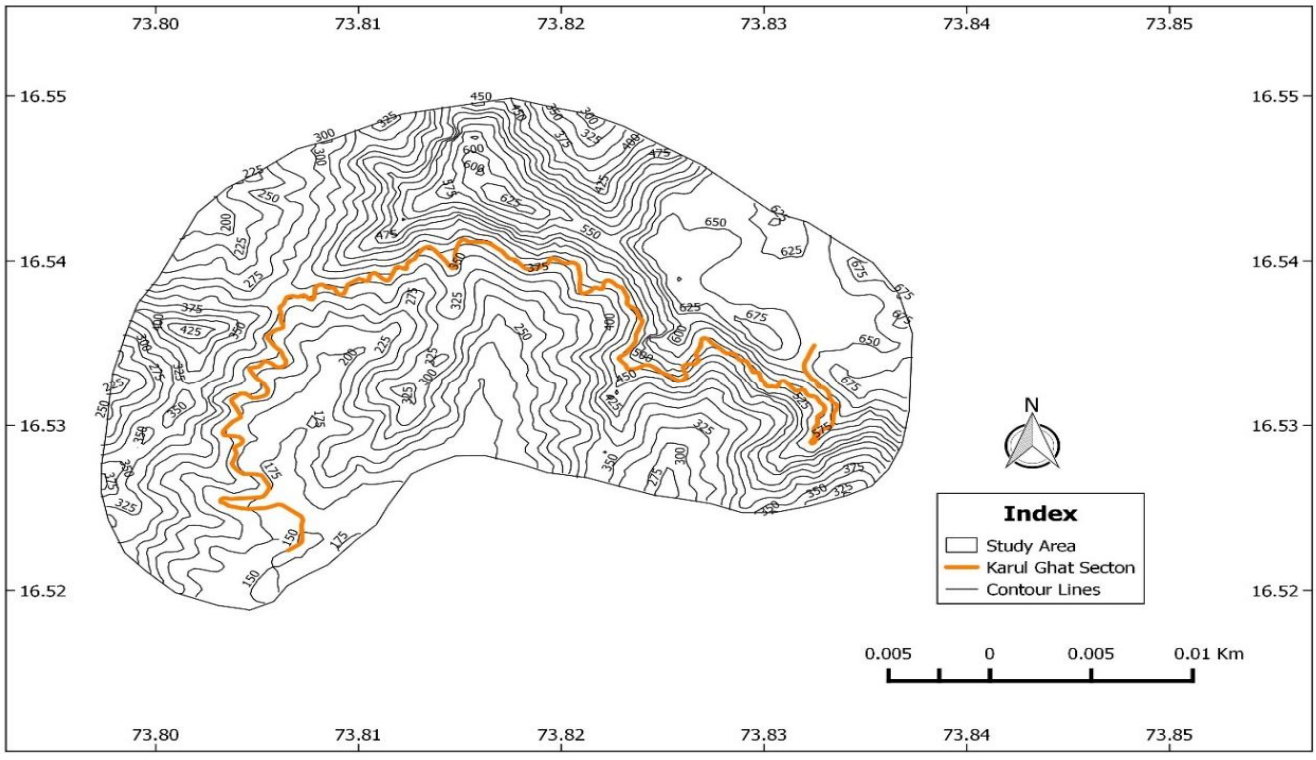


Fig. 3 Contour Map

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Lineaments of area-We prepared lineaments map of area in GRASS 6.4.4 of QGIS software. Lineaments map indicates structural weak zones of area. Natural water channels are formed along these weak zones due to these possibility of landslide is more in that area.

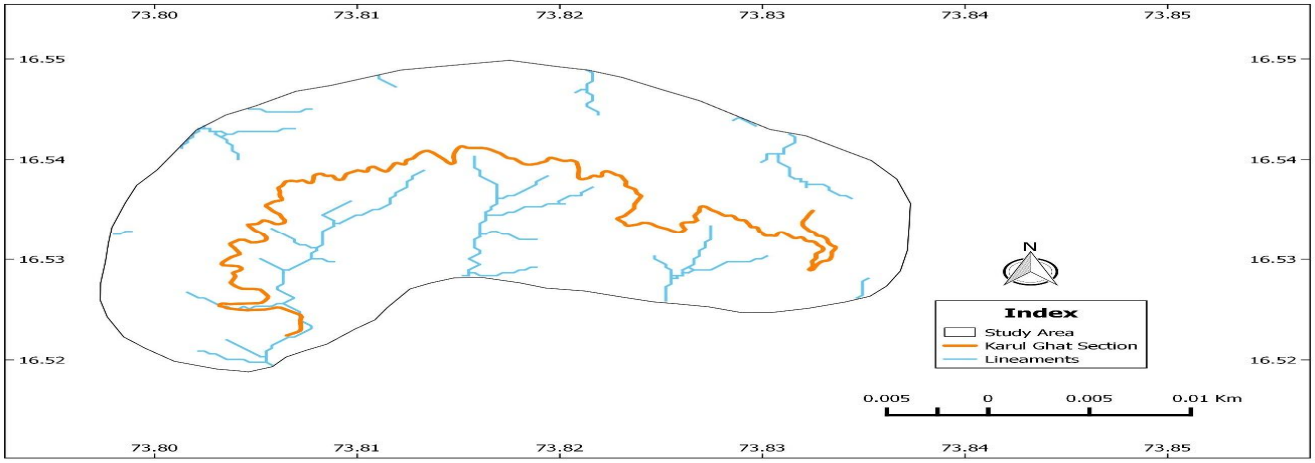


Fig. 4 Lineament Map

V. CONCLUSION

We prepared landslide hazard zonation of study area with help of raster analysis in QGIS software. In map red colour indicates very high severity of risk similarly dark green colour indicates very low risk. It is prepared to assist mitigation planners in wake of landslide trigger. In the present study remote sensing and field data has been used to prepare landslide inventory. Remote sensing data is further used to delineate drainage pattern, photo lineaments, structural features, lithological features area by applying digital image processing techniques Geological features are analysed using criteria such as colour, tones, topography and stream drainage pattern from the imageries. Digital elevation model data is used to generate primary topographic attributes namely and slope.As shown in Fig.5 Red colour indicates high severity of risk similarly green colour indicates low risk.

High resolution temporal data like QUICKBIRD, GEOI containing pre and post disaster event, the digital elevation model based on LiDER may be used for getting higher level of precision in derived database. The raster analysis like IVM may applied for various various areas of Western Ghats especially for urban planning and disaster related rehabilitation. It is possible to undertake the task of road planning based on hazard zonation mapping along with available spatial data around the same.

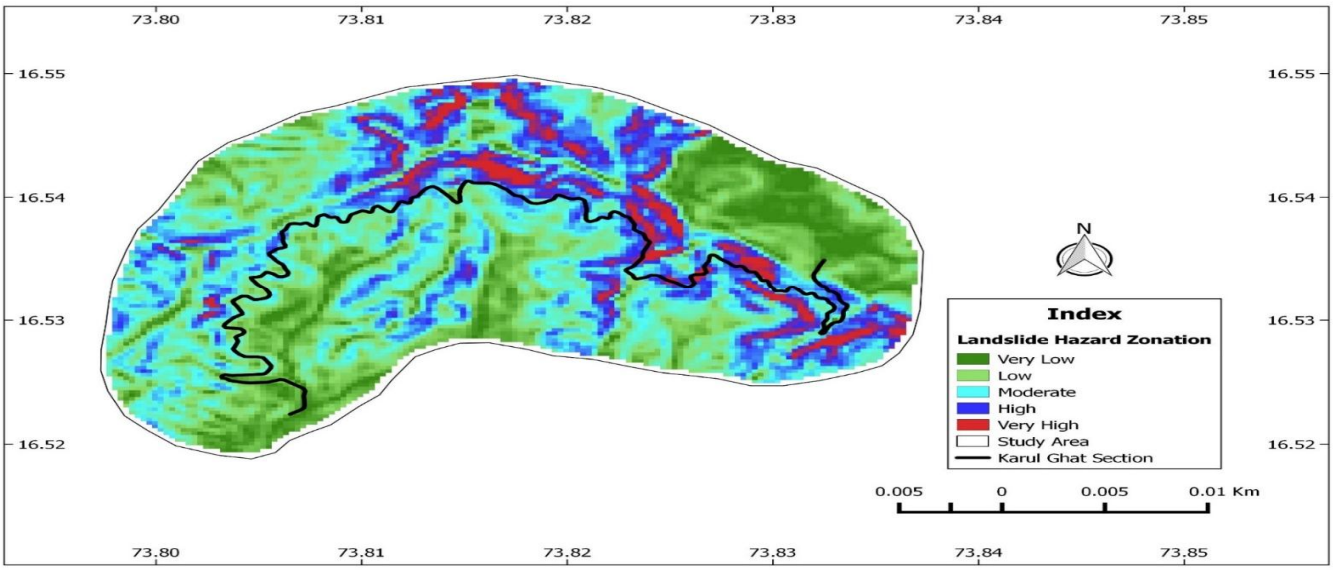


Fig. 5 Hazard Zonation Map

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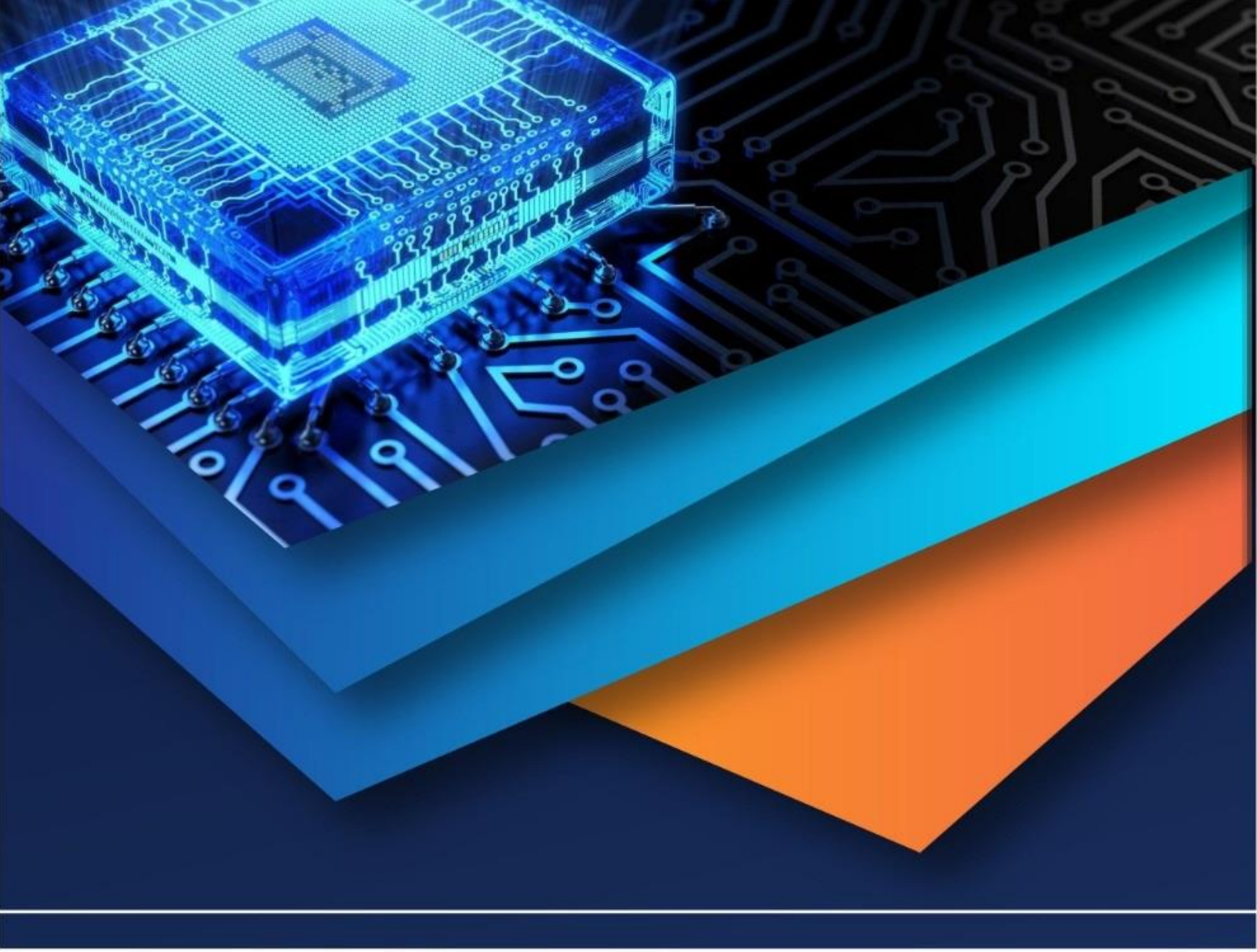
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