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Sustainable Traffic Management and Signal Time Optimization at Basaveshwara Circle, Raichur

Hariprsad G[1], Megha Yadav[2], SantoshKumar[3], Nagesh Sugandhi[4]
[1]*PG Student,* [2, 3, 4]*Assistant Professor*
[1, 2]*Department of Civil Engineering, Bheema Institute of Technology and Science, Kurnool, Andra Pradesh, India*
[3, 4]*Department of Civil Engineering, Navodaya Institute of Technology, Raichur, Karnataka, India*

Abstract: ***Traffic analysis is basically the process of intercepting and examining the number of vehicles on the road and deducing the pattern of traffic movement. A traffic survey on Basaveshwara Circle, Chandra mouleshwara circle and Osman Gunj Circle Intersection of Raichur city has been carried out which includes calculation of present traffic density and analysis of traffic volume by adopting the manual method of counting PCU estimations are made and appropriate design by Webster method and corrections are suggested for highway geometry. For the proposed design geometry, the signal time is optimized.***
Keywords: Signal Optimization, Traffic Volume Count, PCU Estimation and Geometric Design.

I. INTRODUCTION

Transport Planning or Transportation is a fundamental element for functioning of any society, region or state and also an important place in modern life and contributes to the Economic, Industrial, Social and Cultural development of any country. The Ability to move people and goods from one location to another is the primary function of a transport of a system. The capabilities of modern transport technology have not been fully exploited to a large extent in Indian cities due to the limitations imposed by uncontrolled urban growth and rapid industrialization.

From the definition of transportation planning we find that "Transportation planning is the field involve with the siting of Transportation facilities (generally street, highways, sidewalks, bike lanes and public transport lines). Traffic capacity of any road is an important part of planning.

It influences the traffic flow in a city. Traffic capacity is expressed as the maximum number of vehicles a lane that can pass a specified point in unit time usually an hour. The volume of traffic repeats not only the number of people requiring to be moved but also their affluences. The volume of transport between two urban centres depends upon the quantity of highways and availability of various transportation modes between these urban centres. The volume also depends upon the interaction between these urban centres.

II. NEED FOR THE STUDY

The selected intersection which is having a much traffic flow due to the less width of the roads and the maximum people will travel in this intersection. Such that due to this problem it will lead to accidents, traffic congestions and delay in travel time. To solve these problems, the study of the present traffic volume and analysis should be made with regard to road geometry like increasing the road width and signal time. By addressing these two issues, the traffic problem can be solved to little extent.

III. OBJECTIVE OF THE STUDY

The extensive literature review paved the way for defining the following objectives for this study:

1) To achieve smooth and easy flow of the traffic at intersection
2) To develop methods for improvement in general and solving specific problem in particular.
3) To have safe, convenient, rapid and economic transport of persons and goods.
4) To improve the speed of vehicle.
5) To provide a basis for future studies of road expansion.
6) To remove the traffic congestion.
7) To reduce the chances of road accidents to a minimum.

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IV. STUDY AREA

Raichur District is a district in the state of Karnataka. The district is bounded by the Krishna River on the north and the Tungabhadra River on the south. The general slope of the district is from the north-west towards the south-east, its average height above the Mean Sea-Level being just 1,311 feet. Among the type of vehicles plying on Raichur roads, two wheelers constitute majority share with 28% of the total vehicles. Public transport i.e. Buses, contributes only 3%of traffic to Raichur roads whereas share of intermediate transport i.e. auto-rickshaw and maxi-cabs, is about 16% of the total vehicular traffic. However, the non-motorized mode of transport i.e. cycles, constitutes a substantial share of the total traffic (about 24%).

The study area is selected at Basaveshawara Circle Intersection in Raichur.

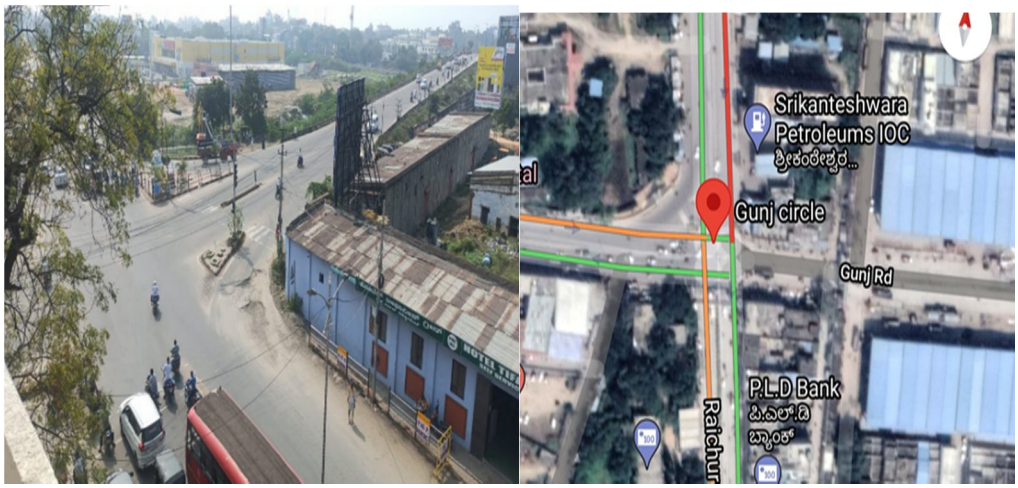


Fig 01 Basaveshawara Circle Intersection Raichur

V. METHODOLOGY

In the present study, traffic volume studies are studied at an intersection for a period of 4 months for a period of 8 hours along the different movement at a intersection. General observations were made for a period of two months for Raichur city roads and Sindhanur- Gadwal road stretch is selected because of the more traffic flow in this road section Intersection at Basaveshwara Circle with traffic signal is identified located near the railway crossing in thecity. Traffic volume count analysis methods were studied and formats for traffic volume count were prepared. Traffic volume studies are conducted to determine the type of vehicles and movements at a given location.

These data can help identify critical flow time periods, determine the influence of large vehicles or pedestrians or on vehicular traffic flow or document traffic volume trends.

The length of the sampling period depends on the type of count being taken and the intended use of the data recorded. For example, an intersection count may be conducted during the peak flow period. If so, manual count with 15- minute intervals could be used to obtain the traffic volume data.

Manual counts are typically used to gather data for determination of vehicle classification, turningmovements, direction of travel, pedestrian movements, or vehicle Occupancy. In the present study, manual count method is adopted for studying the type and traffic volume composition at Basaveshwara Circle Intersection.

The following Table 1 represent the format adopted for traffic volume count for morning peak andevening peaks. Traffic counts during a Monday morning rush hour and a Friday evening rush hour mayshow exceptionally high volumes and are not normally used in analysis; therefore, counts are usually conducted on a Tuesday, Wednesday Thursday. Analysis of results will be made using plots and graphs.

The results analysis made using bar chart and pie chart can be used to analyze the result.Appropriate geometric designs are made based on the volume of traffic.

In the second phase of the work, existing signal time was recorded for the Aruna Circle Intersection. Using trial cycle method, the traffic signal time is optimised.

Table 1: Collection of Data Sample Copy

Routes	Two wheeler	Car	Bus	Truck	Auto	Total Volume	PCU
Basaveshwara Circle to Station							
Station to Basaveshwara Circle							
Basaveshwara Circle to MG Road							
MG Road to Basaveshwara Circle							
Basaveshwara Circle to Gunj Road							
Gunj Road to Basaveshawara Circle							

Webster's Method: The optimum signal cycle is given by: $C_o = 1.5L + 5/1 – Y$ where L = total lost time per cycle, seconds = 2n + R (n is the number of phase and R is all red-time) and $Y = y_1 + y_2$. Then, $G_1 = y_1/Y(C_o – L)$ and $G2 = y_2/Y(C_o – L)$. Similar procedure is followed when there is more number of signal phases.

VI. RESULTS AND DISCUSSIONS

A. Traffic Volume count Analysis

The following observations were made at Basaveshwara Circle Intersection with eight different movements of traffic is tabulated and the results are plotted.

Table 2: Basaveshwara Circle Data Collection for Traffic Volume Analysis

			Traffic Study-RAICHUR INTER-ROADS												
			TRAFFIC TURNING VOLUME COUNT												
AICHUR			DATE:05-05-2022 TIME:7:30-9:30am							ENUMERATOR:					
values Used		3	1	0.5											
saveshwara Circle			DIRECTION:							WEATHER:MORNNG					
BUSES			Private Vehicles & IPT			Goods Vehicles									
Time	City Bus	Mini Bus	Other Bus	Van/Maxi Cab	Car & Taxi	Two Wheeler	Auto Rickshaw	LCV	Trucks/2A xle	MAV	Tractor	Push Carts	Cycles	Bullock Carts	PCU Value
Goshala Road to Basaveshwara Circle															
7:30-8:30	2	0	0	0	27	186	0	39	0	3	2	0	17	0	188.5
8:30-9:30	9	0	0	0	110	484	0	97	0	8	0	0	10	0	505
Basaveshwara Circle to Goshala Road															
7:30-8:30	6	0	0	0	38	211	0	29	0	7	4	0	0	0	233.5
8:30-9:30	8	0	0	0	96	402	0	19	0	13	9	0	1	0	406.5
Basaveshwara Circle to Lingsugur Road															
7:30-8:30	14	0	0	0	36	173	22	16	6	7	0	0	0	0	241.5
8:30-9:30	21	0	0	0	43	362	47	14	19	13	16	0	2	0	480.4
Lingsugur Road to Basaveshwara Circle															
7:30-8:30	11	0	0	0	70	210	47	63	8	0	0	0	14	0	349
8:30-9:30	8	2	0	0	55	267	31	40	9	3	4	0	0	0	337.5
Basaveshwara Circle to Ambedkar Circle															
7:30-8:30	3	0	0	0	33	103	51	18	2	2	0	0	1	0	175
8:30-9:30	11	0	0	0	56	394	89	29	5	4	6	0	5	0	451.5
Ambedkar Circle to Basaveshwara Circle															
7:30-8:30	0	0	0	0	27	77	46	13	0	0	1	0	3	0	129
8:30-9:30	1	1	0	0	43	264	34	24	3	0	0	0	2	0	249
Basaveshwara Circle to Gandhi Chowk															
7:30-8:30	6	0	0	0	27	123	39	11	0	6	0	0	0	0	174.5
8:30-9:30	13	0	0	0	43	316	48	27	0	2	0	0	2	0	322
Gandhi Chowk to Basaveshwara Circle															
7:30-8:30	0	0	0	0	21	196	33	18	0	0	0	0	3	0	171.5
8:30-9:30	0	0	0	0	38	377	54	34	0	0	0	0	2	0	315.5

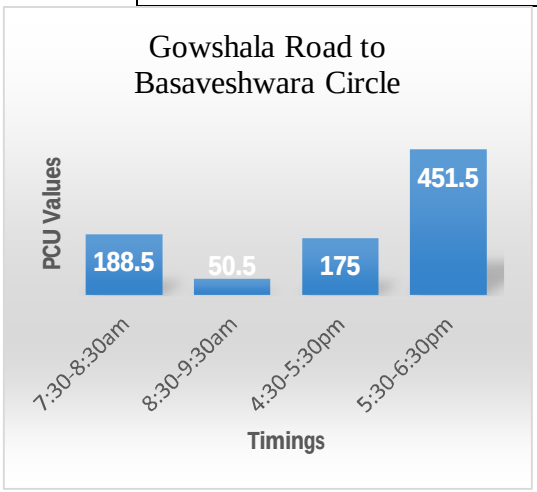
Table 3: PCU Value Table

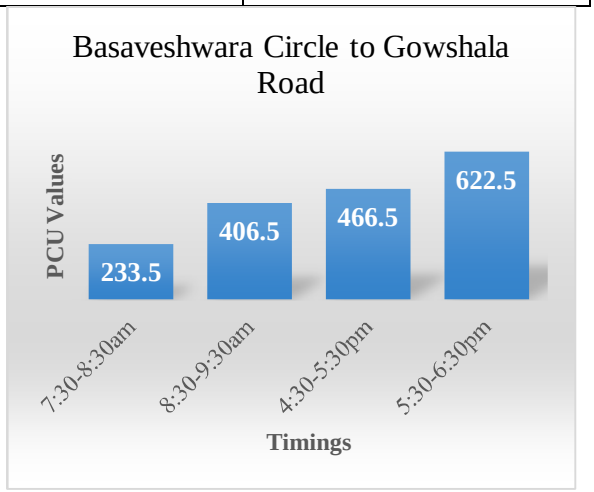
Sl. No.	Vehicles class	PCU values for Urban roads
1	2-wheelers	0.4
2	3-wheelers	0.5
3	4-wheelers	1.0
4	6-wheelers	2.2

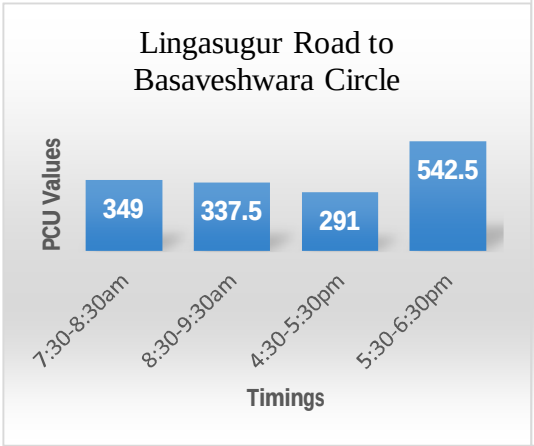
Table 3 represents PCU capacity per day for different types of roads according to IRCrecommendations.

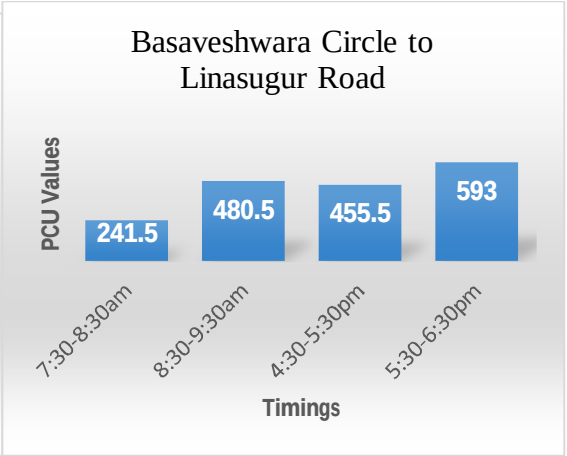
Table 4: Capacity of Different Types of Roads

Types of roads	Capacity PCU per day (both direction)
Single lane with 3.75 m wide carriage way and normal earthen shoulders	1000
Single lane roads with 3.75 m wide carriage way and 1.0 m wide hard shoulders	2500
Roads with intermediate lanes of width 5.5 m and normal earthen shoulders	5000
Two lane roads with 7.0 m wide carriage way and earthen shoulders	10000
Four lane divided highway (depending on traffic access control)	20000 to 30000









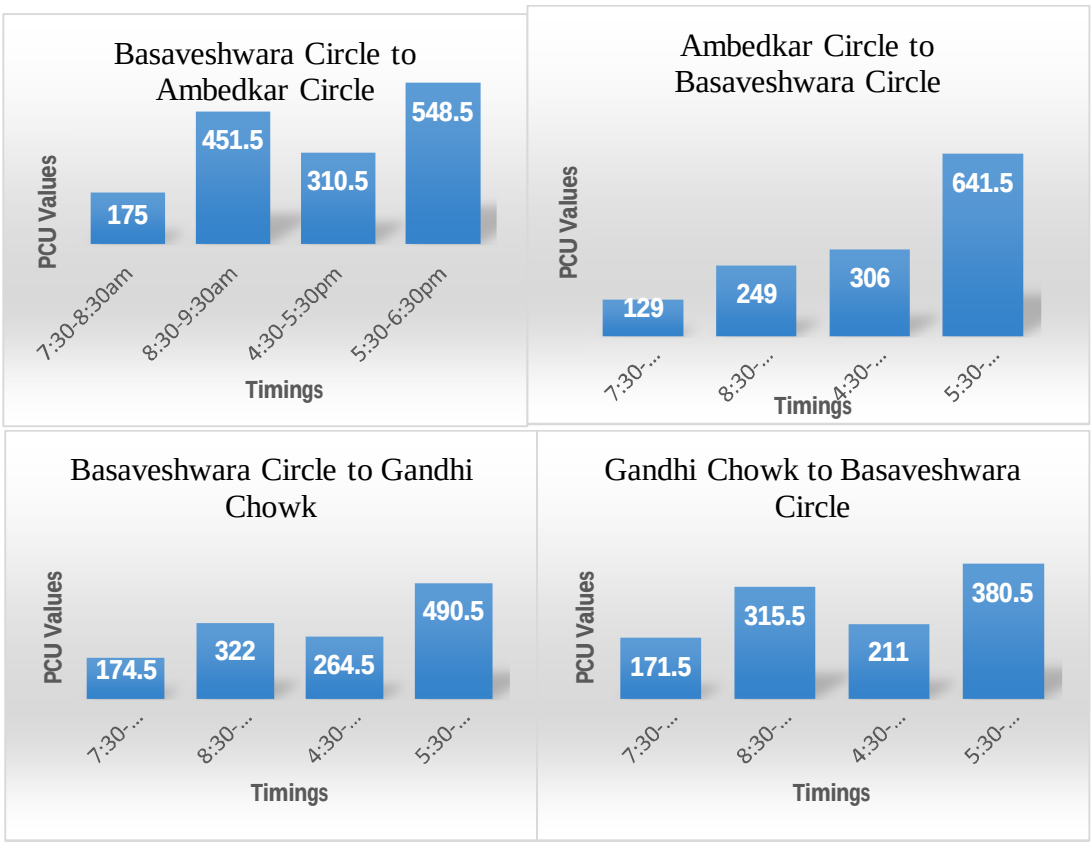


Fig 02: Traffic Volume Count Analysis Basaveshwar Circle Intersections

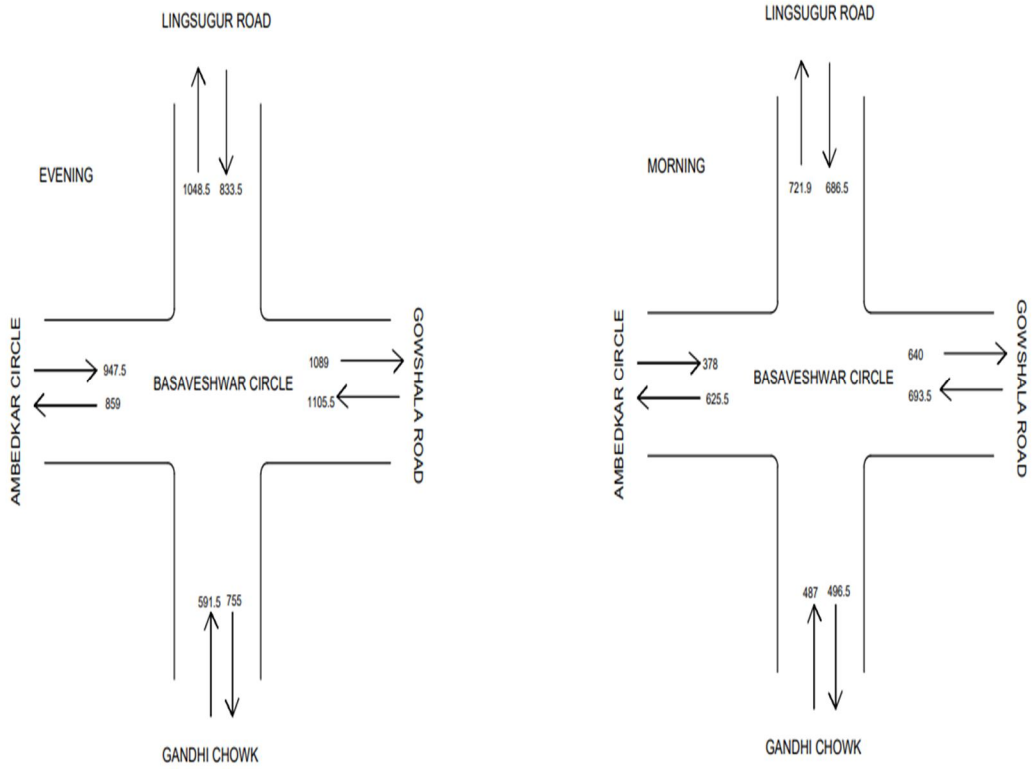


Fig 03 Basaveshara Circle Intersection

Table 04 Calculation of Total Cycle Time Morning

Parameters	N	S	E	W
Normal flows PCU/Hr	1408.4	983.5	1333.5	1003.5
Saturationflows PCU/Hr	5800	4500	5800	5800
Amber time secs	2			
All red time secs	8			
Phases	4			
Yn	0.242			
Ys	0.218			
Ye	0.229			
Yw	0.173			
Total Critical ratio Y	0.448			
Total lost time L	2n+R	16		
Optimum cycle length Co	1.5L+5/1-Y	52.58		
Green Time Gns secs	yns/Y(Co-L)	19.80		
Green Time Gew secs	yew/Y(Co-L)	18.75		
Total Time secs	48.56			

Table 04 Calculation of Total Cycle Time Evening

Parameters	N	S	E	W
Normal flows PCU/Hr	1882	1346.5	1806.5	2194.5
Saturationflows pcu/hr	5800	4500	5800	5800
Amber time secs	2			
All red time secs	8			
Phases	4			
Yn	0.324			
Ys	0.299			
Ye	0.311			
Yw	0.378			
Total Critical ratio Y	0.610			
Total lost time L	2n+R	16		
Optimum cycle length Co	1.5L+5/1-Y	74.49		
Green Time Gns secs	yns/Y(Co-L)	31.078		
Green Time Gew secs	yew/Y(Co-L)	36.239		
Total Time secs	77.3169371			

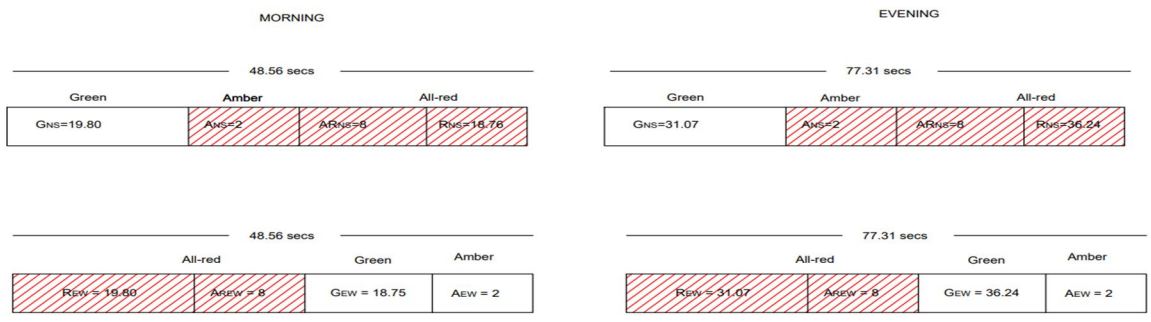


Fig 04 Total cycle time Basaveshwara Circle Intersection phase diagram

VII. CONCLUSION

The present study concludes that the proposal suggested at Basaveshwar circle can be adopted for the smooth and easy flow of traffic without causing delays. The proposal is made with the design corrections in highway geometry like widening the roads at intersection, providing adequate drainage facilities, signal optimization, pedestrian crossings, increasing in turning radius for safe convenient rapid and economic travel of road users. The width of the intersection is increased from 18 m to 22 m with appropriate design aspects. The signal time is optimized to 90and 69seconds for each lane according to the proposed design geometry. The proposed signal time is increased from 60 seconds to 90seconds and 69seconds for Basaveshwar circle respectively. Hence, it can be concluded that this increase in signal time will reduce the traffic delays and also it reduce the road accidents. It can also be concluded that due to the adequate provision of pedestrian crossing the rate of pedestrian accidents may be minimized.

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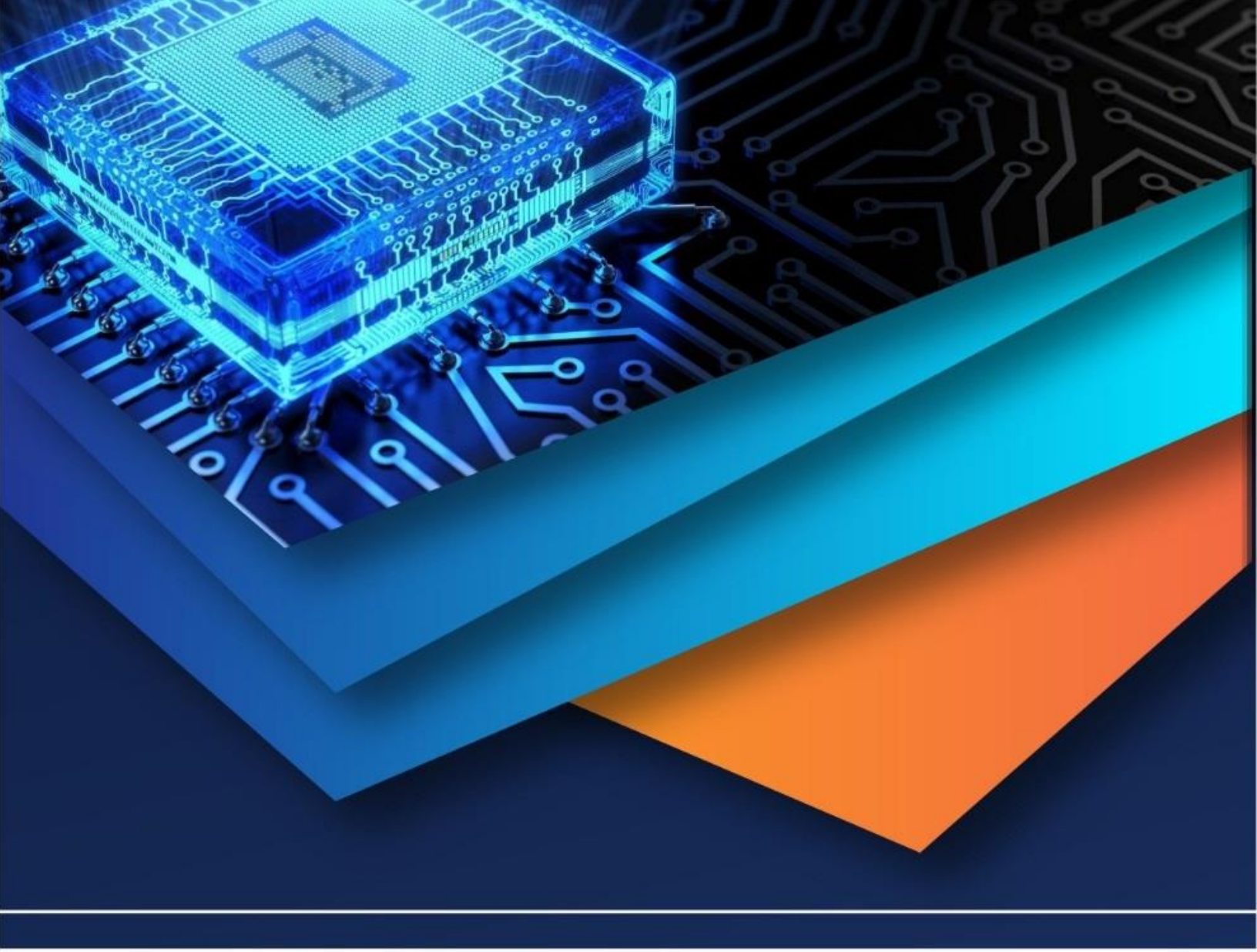

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