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Travel Behaviour Analysis using Transcad, A Case of Visakhaptnam City, India

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Abstract: ***The travel demand in Visakhapatnam city is continuously growing due to its employment in Industrial sector, software sector, higher education and commercial activities. Visakhapatnam city changing dynamically in last two decades. The residential land use is 8.33% (2001) changed to 20.09% (2011) and Vehicles on the road has changed dynamically from 0.25 Million (2008) to 1 Million (2016). It is destined for greater avenues and grand possibilities in terms of Industrial development, tourism, life-style and culture. Hence, the present study is carried out to understand travel behavior at zonal level by considering various existing components of Visakhapatnam city.The travel behavior of Visakhapatnam city has been studied in 72 wards, then inventory and home based interview (HBI) was conducted for 359 samples. The travel trip demand model is analyzed through Multiple Linear Regression Equation (MLRE) technique considering various household attributes, The Travel Trip Generation Model is known as —TTGM is developed and the trip distribution model is further calibrated using TransCAD software. The Gravity based model incorporating trip interchange amongst 28 wards which is prepared from 72 wards based on homogeneous characteristics. Based on developed model and desire line diagram the major critical points were identified And then Integrated planning Proposals like BRTS, MRTS and NMV Route Network has been proposed for better development of a city network. Therefore the tendency of utilization of Public Transportation will enhance in Visakhapatnam City.***

Keywords: Home Based Interview (HBI), Travel Behavior Characteristics, Trip Generation, Trip Distribution, MLRE, Gravity Model, Integrated Proposals.

I. INTRODUCTION

Urban Transportation Planning is an area which deals with the process of planning new facilities and t process of determining how best to utilize the available facilities. Travel behaviour means movement of peoples from one place to another place with a particular purpose of choosing any travel mode. Urban transportation is a macroscopic study of the inter relationship between demand and supply of transport facilities. Urban travel demand is growing at an exponential rate as a result of the multitude of activities in urban centres coupled with population growth. Travel demand is influenced by various attributes of area grouped under main two heads (i) Urban area (ii) Urban Population

II. STUDY AREA

The Present study is carried out in Greater Visakhapatnam Municipal corporation area (GVMC) and city is a fast growing city in terms of population and economic growth and with the vehicular growth. The city now has come under limelight and many financial, cultural; tourism investments have planned in the city, making a Financial capital of Andhra Pradesh.

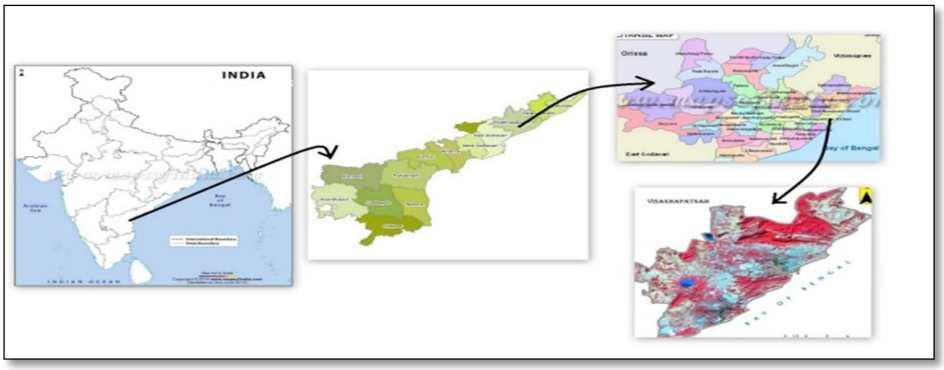

Fig 1. Visakhaptnam Study Area Map

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Visakhapatnam city is divided into 6 Zones and in turn into 72 Wards, and the study has conducted in such a way to find out the primary household characteristics across 6 Zones and secondly to find the travel behaviour characteristics. Household characteristics have been prepared for all 72 wards and detailed analysis had made.

III. OBJECTIVES

The objectives of this study is based on travel behavior characteristics study and planning proposals of Visakhapatnam city and are as follows:-

1) To Study Travel Behavioural pattern and Household Characteristics and

2) To Develop Travel Trip Generation Model (TTGM) and also Trip Distribution for ward and zonal trip interchanges using TransCAD software.

3) Integrating of various Transit systems with an Urban Road Network for Visakhapatnam city.

IV. RESEARCH METHODOLOGY

An Initial study was carried out for a topic through literature reviews to get a proper understanding in context of the present study. Broad study scope was finalized based on literature review of study conducting at national and international level. Based on the literature and discussions with the Visakhapatnam corporation bodies, officers, Town planners, and traffic wing department the objectives were prepared and the below methodology is adopted

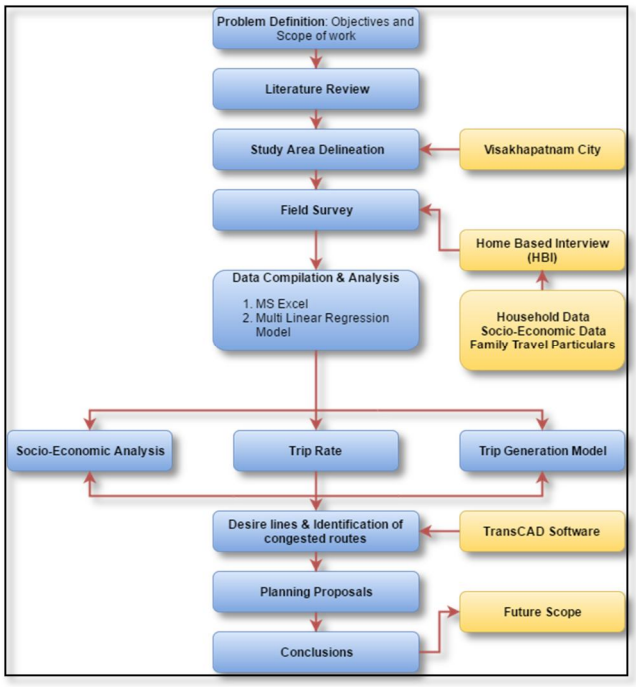

Fig 2. Study Methodology

V. LITERATURE REVIEW

The literature study shows the research work carried by different researchers on travel behavior characteristics, travel demand forecasting and Multi linear regression models, Trip distribution using Gravity and other models and also Improvement of cycling and mass transportation system in the city.

This literature review started with studying of various sampling methods and sampling techniques and viewed literature in preparation of household questionnaire and, various reports stating the household characteristics like Socioeconomic variables(Population, Employment, Income, Working Member) are leading variable for production of trips and concluded to use these variables as input variables for travel behavior characteristics. Now for developing Travel Trip Generation Model (TTGM) Equation there are certain methods to find out the Model Equation like SPSS But as per the data collected and obtained secondary data the Multi Linear Regression (MLRE) equation will give the Model for the given Input variables and using the same (MLRE) we could find the values of trip Intensity Equation also for different density population and different trip for given land use.

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For Trip distribution Gravity model calibration is best method adopted in maximum studies and for this study area also we used a gravity model for calibrating O and D matrix and results were analyzed in TransCAD software for easiness and desire line diagrams can be obtained in this software and various infrastractural proposals like BRTS route Network, MRTS Network and Cycling Network is studied briefly to make an Integrated network in city.

VI. DATA COLLECTION AND ANALYSIS :

The Inventory data of study area are collected from various resources, Greater Visakhapatnam Municipal Corporation (GVMC),Statistical Documents, Land Use patterns maps, Various Maps of Vizag city-Zone wise maps, Road Network,Visakhapatnam Urban Development Authority (VUDA),Classified data of vehicle growth and field Surveys on Household Base Interview of 359 samples is carried out in city. Across 6 different zones of city from zone 1 to zone 6 and detailed collection of household characteristics and Travel-Information

For the city planning process the present characteristic of city household is very important. To have the any policy planning or transportation planning at present scenario the household analysis is governing factor for the effective planning purpose.

The home interview survey was carried out for 359 households. The distribution of samples collected with respect to home interview survey (HBI) at different study Zones of Visakhapatnam city is presented in following section.

A. Zonal Wise analysis

There are 6 Zones in which Zone 2 and Zone 3 Having a maximum Density in the City which having more than 150 PPHA and the rest part of city is covered with hills and Vacant Land uses. So the maximum samples in the survey are conducted at Zone 2 and Zone 3 and Zone 4 constitute of industries so that sample size is distributed according to density wise

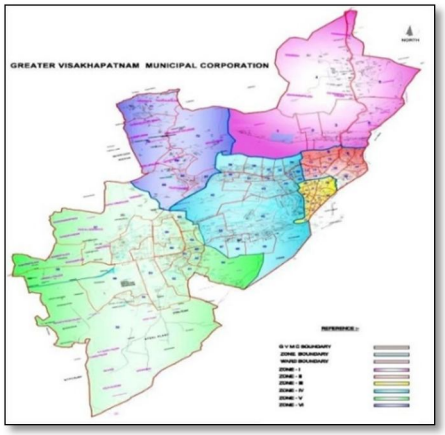

Fig 3 : Zone Map

TABLE 1: SAMPLE SIZE DISTRIBUTION

Zone No.	Ward No	Area in Sq. Km	Population as Per Census 2011	Density (PPHa)	Sample Size
I	1 to 6	118.24	175210	14.81	28
II	7 to 18	17.56	272665	155.27	70
III	19 to 30	9.35	238689	255.28	66
IV	31 to 49	87.3	432081	49.5	101
V	50 to 65	229.71	382552	16.65	67
VI	66 to 72	70.84	203273	28.7	27
Total		533 Sq.Km	17,04,470		359

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B. Income Wise Analysis

From different Research Papers and different Views given by different research People then Visakhapatnam Income wise classified into following categories:

1) LIG(<12,500) include Low Level (<3,500), Middle level (3,500-7,500), High level of Low income (7,500 – 12,500)
2) LMIG (12,500-25,000) which are better than LIG people whose living conditions are adequate.
3) MIG(25,000-70,000) which include Middle MIG (25,000 – 50,000), High MIG (50,000 – 70,000) where
4) HIG (> 70,000) and they have a proper standard of living conditions.

C. Household Structure

Household structure is done based on Income level , Zonal household structure and Income class

1) Income-Level Wise Household Structure

The average number of members in HIG is found to be maximum of 4.56. which is more than the city level. and trips produced by HIG is more than other Income groups because of the income structure and maximum vehicle ownership. No of school going children is found maximum at HIG and No of working members is also found maximum of 1.41 for HIG.

TABLE 2: INCOME LEVEL HOUSEHOLD STRUCTURE

Class	No of Members	No of Total Working Member	No of school Going children	No of Vehicles	Trip Produced
LIG	3.92	1.04	1.17	1.29	29.92
LMIG	3.93	1.11	1.17	1.56	34.49
MIG	4.17	1.29	1.18	2.03	37.80
HIG	4.56	1.41	1.27	3.22	44.27

2) Zonal Household Structure.

As per Indian Conditions the normal family size is ranging between 4 and 6. And if it is joint family then the size will be higher. Shows the range of household size for various zones of the city. The household size varies from minimum 2 to maximum 8 with an average of 4.17.

TABLE 3: ZONAL WISE HOUSEHOLD STRUCTURE

Zone	Avg. H.H size	Avg. Children	Avg. Adults	Avg. Working members
Zone 1	4.25	0.96	3.29	1.14
Zone 2	4.16	1.20	2.96	1.26
Zone 3	4.05	1.26	2.79	1.20
Zone 4	4.07	1.22	2.85	1.31
Zone 5	4.15	1.21	2.94	1.19
Zone 6	4.37	1.07	3.30	1.26
City level	4.17	1.15	3.02	1.23

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3) Income class

The Income structure is observed and the minimum of 7,000/- per month is observed and the maximum observed is 2, 20,000/- Per month and Average at city level is found to be 39,650/- and Average HIG income is found to be 1,05,500. The MIG having an average value of 42,450/- per month which is quite observed from survey.

TABLE 4: INCOME STRUCTURE OF DIFFERENT

Level	Minimum Income (In Thousands	Maximum Income (In Thousands)	Family Income(in Thousands)
LIG	7	12.5	10.75
LMIG	14	25	21.11
MIG	26	70	42.45
HIG	72	220	105.39
City level	7	220	39.65

D. Vehicle Ownership Pattern

1) Zonal wise Vehicle ownership: the Zone having a maximum vehicle ownership of almost 2.37 veh/hh and Zone 3 with 2.05 veh/hh and Zone 1 having least vehicle ownership of 1.68 and in a city level the average value is 1.93 constitute 1.19 of 2 W, 0.34 4 Wheeler and cycle of 0.35 at city level.

Maximum 2wheeler and 4 wheeler is observed at zone 2 at a value of 1.44 veh/hh and 0.66 veh/hh.

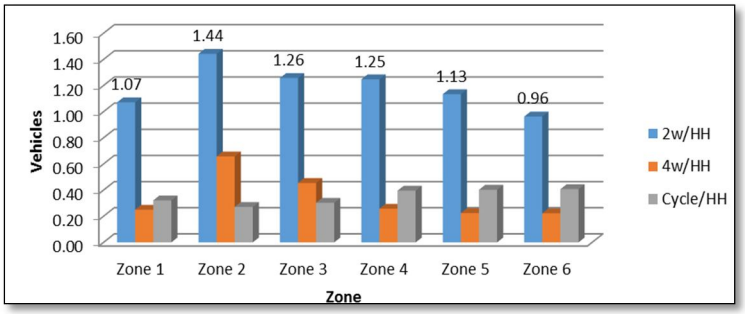

Fig 4: Zonal Wise Vehicle Ownership

The information gathered for household ownership of vehicles viz. bicycle, two wheeler, Auto and 4 wheeler are analyzed sector wise and presented in Table 5.13. It is observed that 2 wheeler ownerships in households range from 0.93 (Zone 6) to 1.44 (Zone 2)

2) Income level Vehicle Ownership

The vehicle ownership is the no of vehicles owned by household and always the HIG will have maximum Vehicle Ownership and the current analysis also showing HIG having a maximum Ownership of 3.22 Vehicles/HH and Lowest is observed at LIG with a value of 1.29 vehicles/HH

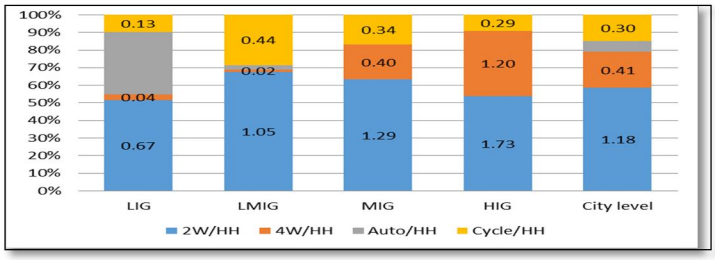

Fig 5: Income Levl Wise Vehicle Ownership

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E. Purpose Wise Trip Genreration

The Survey states that the total trips/ household/week are ranging between 27.15 (Zone 6) to 43.78 (Zone 2) at Zonal level. The average trip generated/household/week is 35.01 out of which 28.59 trips are for work and education purpose while 6.40 trips for shopping, recreation, social and other purposes.

1) *Trips Produced From Different Income Classes*: The overall trips produced by the HIG people are more than other Income classes of people since they are having maximum vehicle ownership and other factors like household members and total working member. And the average trip produced by HIG is almost 44.27 trips and followed by MIG having 37.80 trips and LIG, LMIG are almost having the same trips of 29.92 and 34.49.

TABLE 5: PURPOSE WISE PERCAPITA/DAY

Zone No.	Work	School	Shopping	Recreation & social	Total
I	0.50	0.38	0.05	0.09	1.01
II	0.63	0.49	0.15	0.24	1.50
III	0.66	0.44	0.13	0.22	1.43
IV	0.68	0.43	0.09	0.12	1.32
V	0.49	0.43	0.06	0.09	1.06
VI	0.43	0.35	0.05	0.05	0.89
City	0.56	0.42	0.09	0.11	1.20

The average purpose wise trips/person/day. The average trip generated/person/day observed is 1.20; out of which 0.56 trips are for work purpose and 0.42 trips for school purpose and remaining 0.22 is for other purposes.

2) *Mode Wise Trip Generation:* It is evident from this that the maximum person trips are by personalized mode of transport. The household survey is the method to have the collection of realistic data of citizen which will help in planning process. The above result present the household characteristics of Visakhapatnam city it also discuss the travel behavior of city. The result represents the work purpose trips are maximum.

TABLE 6: MODE WISE PERCAPITA/DAY

Zone No.	2 Wheeler	Car	Bus	Auto	Cycling & Pedestrians	Total
I	0.41	0.11	0.25	0.12	0.12	1.01
II	0.61	0.33	0.21	0.23	0.11	1.50
III	0.57	0.31	0.20	0.25	0.10	1.43
IV	0.57	0.21	0.22	0.21	0.09	1.32
V	0.46	0.11	0.22	0.16	0.11	1.06
VI	0.31	0.09	0.24	0.14	0.10	0.89
City	0.49	0.19	0.22	0.19	0.11	1.20

3) *Trip Length In City:* Trip length of city is measured as the trip distance produced by a person on an average of a day. we conclude that at city level the length of trip/capita/day is 7.3 km and according to metro cities it will have a trip length of 7.5 Km on an average.

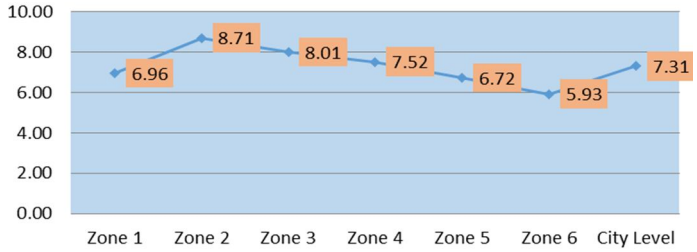

Fig 6: Trip Length Percapita/Day

And above that Zone 2 is having a maximum trip length of 8.71km because it lies in CBD Area then the movement of people from household is very high so more trips are produced and due to increase of the trip length, Zone 6 will have less trip length with only 5.93 km/capita/day.

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VII. TRAVEL TRIP GENERATION MODEL (TTGM)

The **T**ravel **T**rip **G**eneration **m**odel "TTGm in the present context is a multiple linear regression model which correlates the total no of trips generated/HH/Day with different travel indicators. It correlates trip generation with various travel indicators. Five important attributes like family size, family income, school going children, working member and no of vehicle have been incorporated as they have considerable bearing on trip generation rate. The model is developed by considering 359 data sets. Regression Based Travel Trip Generation Model: (Ttgm)

A. City Level

Trip generation model developed using regression method. The input variable of family size, family income, no of working member, no of school going children were considered to predict output of trip generation.

$$TTGm = 0.285 + 0.028 * \mathbf{F_s} + 0.0013 * \mathbf{F_i} + 0.465 * \mathbf{W_m} + 0.19 * \mathbf{S_m} + 0.136 * \mathbf{V_{hh}} \ (\mathbf{R^2 = 0.81})$$

Where F_s = Family Size
F_i = Family Income in thousands
W_m = No of Working Members Per household,
S_m = No of School Going Children/ Household
V_{hh} = No of Vehicles/Househol

TABLE 7: REGRESSION COEFFICIENTS FOR DIFFERENT LEVEL

Class	Family Size (Fs)	Income Level (Fi)	Total Working Member (Wm)	School Going Children (Sc)	No of Vehicles (Vhh)
LIG	-0.14	0.0003	1.05	0.21	0.24
LMIG	-0.01	0.0008	0.77	0.10	0.19
MIG	0.02	0.0015	0.49	0.20	0.17
HIG	0.03	0.0038	0.23	0.11	0.33
City Level	0.028	0.0013	0.47	0.19	0.14

B. Devlopment Of Travel Trip Intensity Model " Ttrim"

Using the ward wise trip rates obtained from TTGm and ward population density values, Trip intensity model (TTrIM) model has been developed through MLRE. The model relates ward trip rate and density to provide the ward trip intensity. The regression analysis model is shown in Eq. 6.2. as:

$TTrIM = 11.99 * Z_{tr} + 1.338 * Z_d$ *(R square = 0.96)*

Where, TrIM = Zonal Trip Intensity, (in Trips/Ha)
Z_{tr} = Zonal Trip rate (In trips/Capita/day)
Z_d = Zonal Density (in Persons/Ha)

TABLE 8. TRIP INTENST

Zone No	Population	Area (Ha)	Trips (G)	Trips (G)/Ha
Zone 1	175210	11824	178924	15.13
Zone 2	272665	1756	403225	229.63
Zone 3	236952	935	357602	382.46
Zone 4	432081	8730	536286	61.43
Zone 5	382552	22971	391653	17.05
Zone 6	203273	7084	176160	24.87

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VIII. DEVLOPMENT OF TRIP DISTRIBUTION MODEL

A methodology for zone delineation is defined to reduce the confusion in Transportation modeling, and at the same time, to minimize the geographical error of the trip end location. As in the 72 wards of GVMC, majorly some wards are having the inter zonal ward trips and these are not much affecting the travel behavior in the city and henceforth new study wards has been prepared from this 72 wards.

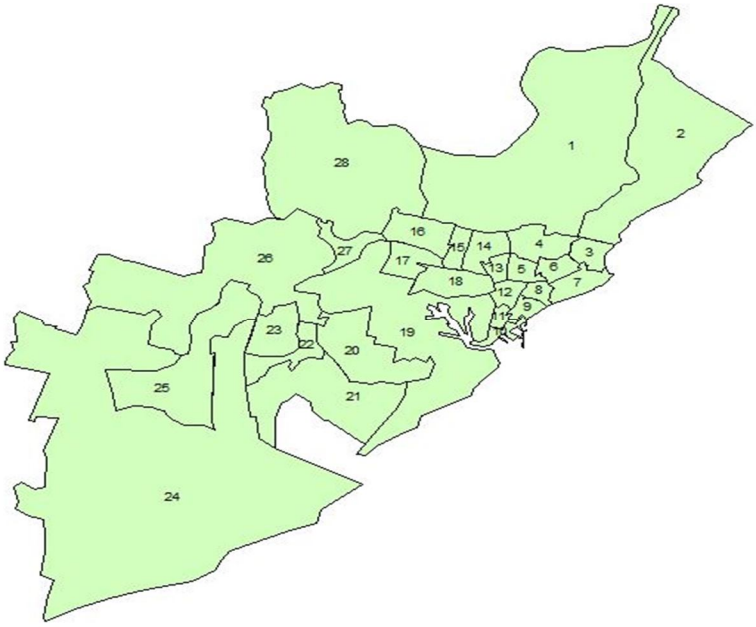

Fig 7: New Study Wards Preparation

In this way GVMC of 72 wards had converted into 28 New Combinations based on the Socio Economic factors, Trip rates of respective wards, Land use pattern and Origin and Destination study of wards as shown

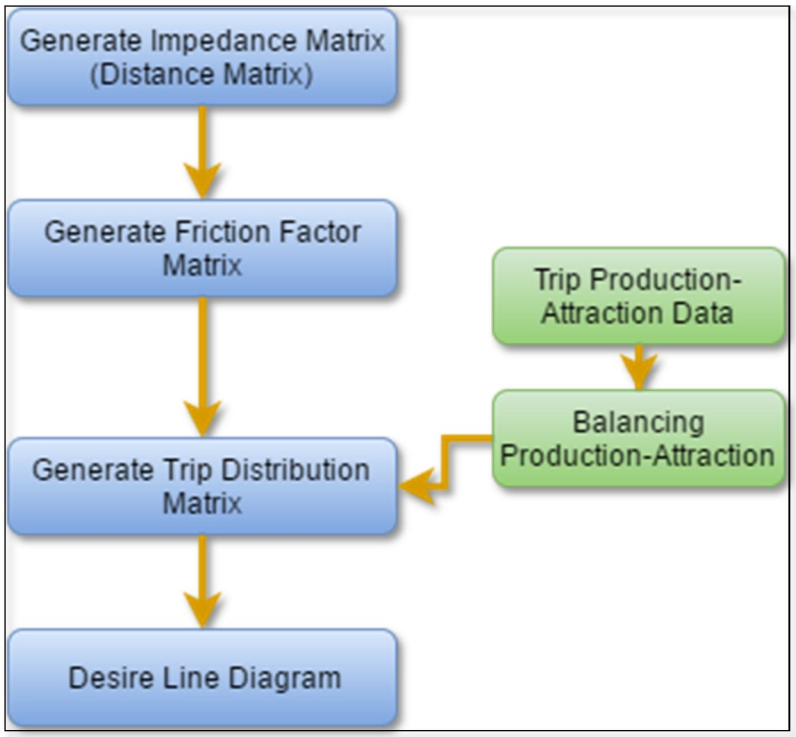

Fig 8: Flow Chart For Generation Of Trip Distribution Using Transcad

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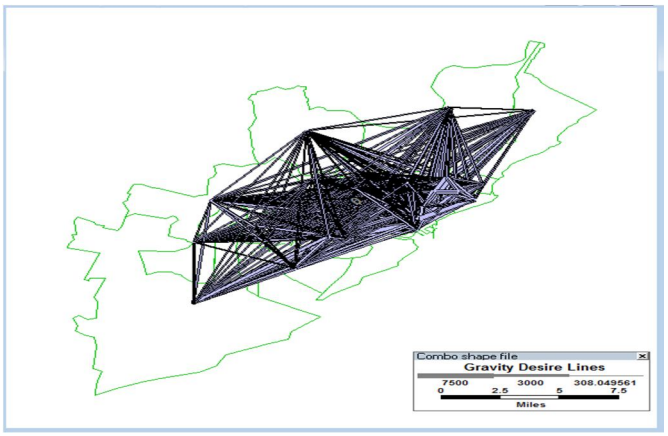

Fig 9: Final Desire Line Diagram.

The Trans CAD software calculating Trips generated from each study wards and find the trip production and attraction data. For this software use aerial distance as a Impedance matrix, it generates Friction Factor matrix. And then by giving the value of trip generated in each study ward the software gives the value of trip attracted in each study ward on the basis of impedance value and friction factor value for each ward.

IX. PLANNING PROPOSALS

Identification Based on the analysis Major arterial roads have some congestion issues or it need to be prepare for the better infrastructure Facility. Along with demographic growth, congestions become increasingly extensive at National Highway-16 due to various vehicles have been entered on this road at NAD junction. Secondly, problems for the better public infrastructure facility to industrial area And thirdly from the trip analysis poorna market is having the maximum trip rate and also the main core part of city where large people comes for shopping, recreation and it is most congestion portion of city so there should have better linkage of various facilities from this point to other part of city.

So these 3 places are most concerned spots in this study so this to be solved for the smooth flow of traffic in the Visakhapatnam city.

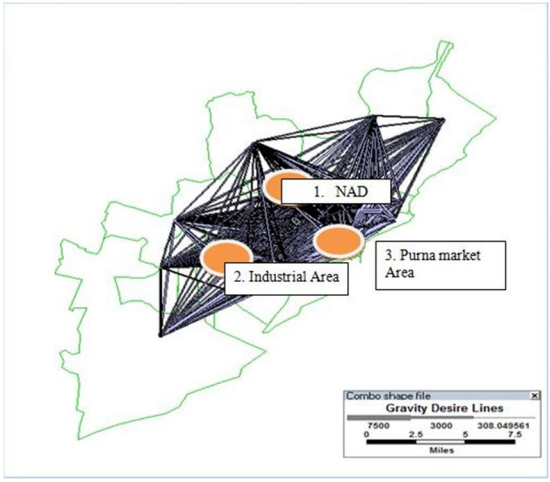

Fig 10 : Identification of congested points

These are various planning proposals had been integrated for better transportation network in Visakhapatnam city.

1) Planning of Road Infrastructure Development at N.A.D Junction.
2) Planning of Better Public Transportation facility across City area.
3) Interlinking of BRTS and Metro Network Planning with Urban Road Network.

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A. N.A.D Junction

NAD X Road or NAD Kotha Road is one of the major junctions and commercial centers in Visakhapatnam, India. It is named for the Naval Armament Depot NAD X Road is well connected 4 Road Junction within Visakhapatnam. It connected with areas such as Gajuwaka, Simhachalam, Asilmetta, Pendurthi and Maddilapalem via NAD X Road.
Present Condition of the Road is normal 4-way junction Road Connecting 4 important Nodes of city.

B. Gurudwara to Gajuwaka:

No of Lanes: 2 Lanes and a Service Road.
Width of Lane: 3.5 meter Road and a shoulder of 0.8 m.
Intersection: Signalized Intersection.
Median: 0.6 m Median at middle.
Traffic: Mixed Traffic.

1) Problems:

a) There is a large movement of vehicles continuoulsy in all 4 directions majorly on Highway stretch from gajuwaka to Gurudwara
b) Duration of Delay is 180 secs which is high on National highway.
c) Queue Length of about 1.2 KM at Peak Hour time (from Morning 8Am -10:30 Am and Evening 5:30 Pm -8:30 Pm) Because of a major industrial area passing this junction.
d) Peak hour Per direction trips (PHPDTs) exceed 15,000 (source: GVMC)

2) Planning Proposal:

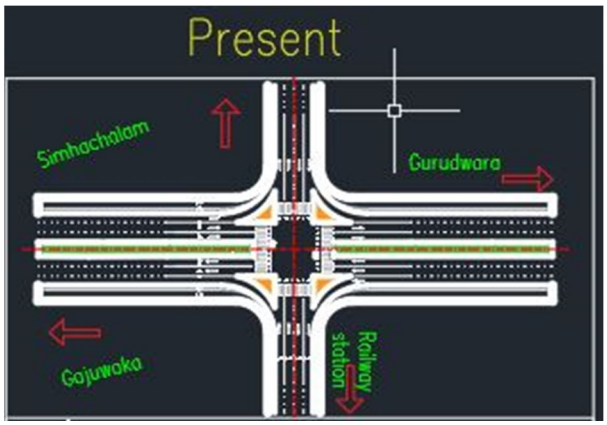

Fig 11: Existing Situation At N.A.D Junction Road

Recently GVMC had started planning a proposal for this 4-way junction to reduce the Traffic load on this road and also for the free movement of traffic on this Highway road by proposing a flyover at above the surface and underpass for the movement from simhachalam to Railway station and radial ring road for left turn and right turn movements.

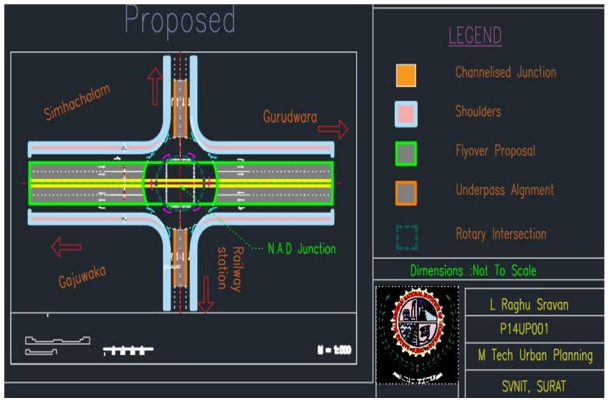

Fig 12: Planning Proposal Of Flyover At N.A.D Junction Road

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In the above proposal it is very clearly planned that without the need for any traffic to be stopped by red lights, even for left and right turns they are formed under rotary intersection and are guided through it.

C. BRTS Route Network:

1) Old Post office- Pendurthi Transit Corridor (9.8 Km): These corridor is the extension of Pendurthi Transit Corridor: where it extends from NAD and then Passing Marripalem, Kancherlapalem, Gnanapuram, Railway station and Purnamaket and then Finally Kotta Road or Post office.

2) Railway station –Sheilanagar Road (8.5Km): Railway station and Sheila nagar road are mainly for Industrial workers who are working at Industrial zone having companies like HPCL, BPCL and this is short route connecting airport and NAD from railway station.

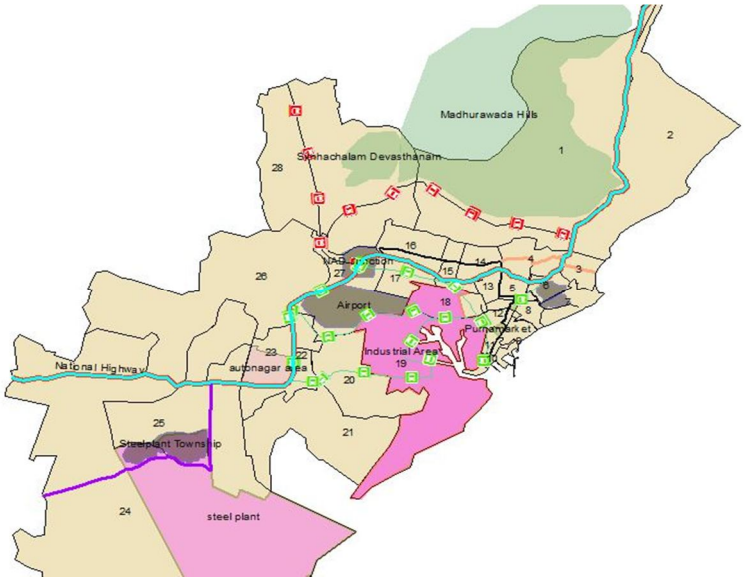

Fig 13: Proposed Brts System.

3) Port Road and Gajuwaka Scindia Road (13.2Km)

This road is having a stretch of 13.2 Km and It is well versed connecting port area and areas like Malkapuram, scindia, Hindustan Shipyard Colony, Sriharipuram, Burma colony and Ex-service man colony. This is a shortest and best route connecting Gajuwaka.

D. Integrating of Brts and Metro Network Planning With Urban Road Network:

The city's importance and ranking in terms of economic development, industrialization, specifically of port activities, steel plant with large scale imports and exports signifies the inter city/ international connectivity of the city through roadways, railways, water ways and road ways. The vast area under the city limits of Greater Visakhapatnam emphasizes the importance of intra city transportation and regular commuting facilities. Due to the rapid Industrialization in the last two decades, It is striving to manage the growing transportation requirements. The transportation network in the city area is dominated by three major arteries, one along beachfront, another along the Northern Hill flank and the third which runs through the city. Visakhapatnam is ideally situated to become the national and international logistics hub. The city is linked through roads, ports and airports to the key economic centers. To leverage this geographic advantage, the city will have to create the link infrastructure required for providing smooth connections. And it should be well integrated with different transit system so that efficiency of smart transit system will be obtained. A special effort has been undertaken to provide interconnecting between major arteries of the city with diversified public Transit Systems. Development of this programme would ease congestion along the major roads and facilitate traffic to by-pass crowded segments of the major roads within the city.

1) Integrated Network System:

a) Bus Rapid Transit System (BRTS).

b) Metro Rail Transit System. (MRTS)

c) Cycling Network (NMV).

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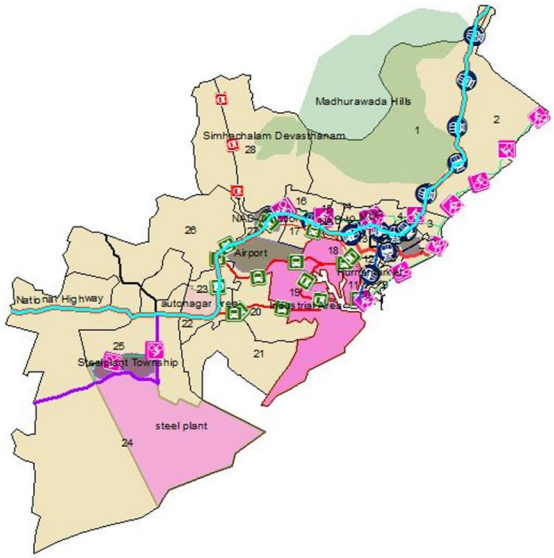

Fig 14: Integrated Route Network System

The integrated network in city very smoothly connected with all important landmarks of city and there is nowhere that 2 transit systems were overlapped so that the effective way of connection was given to entire city. And due to this Integration of network there will be more users attracted to the public transport system so that the Public transport system ridership will increase that reduces the private ownership of vehicles as shown..

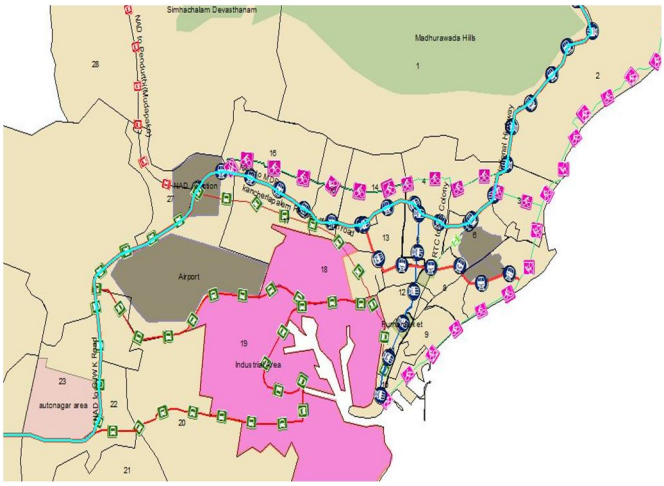

Fig 15 . Various Developed Network System In Visakhapatnam City.

National Highway-16 is the major Link of city and it is connected in the core city so the Metro is planned its major link on NH-16 and with other 2links to purnamarket and Beach Road as shown

And Purnamarket is a commercial market area it is having main importance of connecting all 3 network nearby in a radius of 1.5km and it is having BRTS connected to Gajuwaka and Airport and hen NMV cycle network on beach road and with the Metro transit Network.

NMV network is well planned in Residential areas where the traffic flow is less so that safety of NMV is mainly concerned and it should not disturb the Major arterial roads.

X. CONCLUSIONS

Trip generation and Trip attraction for various urban components has been carried out in present study for rapidly Vehicle growing City of Visakhapatnam. Administrative and Demographic data base was collected from various Govt. Institutions by Inventory survey. And the house hold and travel characteristics related to urban components were collected through Home Based Interview. The main observation and Study Findings have been briefly summarized as under in Table

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TABLE 9 : TRAVEL CHARACTERISTICS

Characteristics	Average Value	Maximum	Minimum
Vehicular Ownership	1.93	3.22 (HIG) 2.37 (Zone 2)	1.29 (LIG) 1.68 (Zone 1)
Car Ownership	0.34	1.2 (HIG) 0.66 (Zone 2)	0.22 (Zone 5 & Zone 6)
Cycle Ownership	0.35	0.44 (LMIG) 0.41(Zone 6)	0.27 (Zone 3)
2 Wheeler	1.19	1.73 (HIG) 1.44 (Zone 2)	0.67 (LIG) 0.96 (Zone 6)
Average Trips	35.01	44.27 (HIG) 43.78 (Zone 2)	29.92 (LIG) 27.15 (Zone 6)
Purpose Wise Trip/Capita/Day	1.20	1.50 (Zone 2)	0.89 (Zone 6)
Mode Wise Trip	19.57 (Bus) 15.13 (car) 15.26 (Auto)	40.59% (2 wheeler)	Pedestrian & cycle (10%)
Trip Length	7.31 (Metro 7.5 Km)	8.71 (Zone 2)	5.93 (Zone 6)

XI. ACKNOWLEDGEMENT

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REFERENCES

[1] Akimsa Fujiwara, Yoriyasu sugie, Junyi Zhang (2010), "A survey and analysis Method to evaluate influence of Pre Trip Information on Commuter's Travel choice behavior"
[2] Bhat C. and Srinivasan S (2005), "A multidimensional mixed ordered-response model for analyzing weekend activity participation", Transportation Research Part B, Vol. 39 (3), pp.255-278.
[3] Caliper Corporation, (2009) "Travel Demand Modelling with TransCAD"
[4] R. Kothari – "Research Methodology – Methods and Techniques", New age international publication.
[5] Dieleman F. M., Dijst M. and Burghouwt G. (2002), "Urban form and travel behaviour: Micro-level household attributes and residential context", Urban Studies, Vol. 39(3), pp.507-529.
[6] Dougals, A.A. (1973), "Home Based Trip End Models: A Comparison Between Category Analysis and Regression Analysis Procedures", Transportation research, Vol.2, pp.53-70.
[7] Dr. L. R. Kadiyali - "Traffic Engineering and Transport Planning" by Khanna Publishers – New Delhi.
[8] Fengijiao ZOU, Zhi Dong, Bing WU (2014), Intercity Urban traveller behaviour Characteristics and Travel Demand Analysis
[9] Grace Corupz and John Peachman, (2003) "Measuring the impacts of internet usage on travel behaviour in the Sydney House Hold Travel survey", ATRF Conference, pp.1-14.
[10] John Bowman and Moshe Ben Akiva, (1997) "Activity Based Travel Forecasting", Travel Model Improvement Program, pp.3-42.
[11] Qian WAN, Peng SU (2011), Modelling the Impact of Smart Growth on Travel Choices: An Enhanced Travel Demand Forecasting Approach
[12] Leena Samual and Dr.Padmini A.K., (2013) "Developing a Trip Production Model based on Residential Land Use Characteristics", IJIRSET, Vol.2, pp277-285.
[13] Michel Pozsgay and Chandra Bhatt, (2000) "Modelling Attraction-End Choice for Urban Recreational Trips: Implication for Transportation and Land Use Planning", PhD Report, Southwest Regional University of Transportation, University of Texas at Austin.
[14] Sarada Pulugurta,Erramapalli Madhu, Ravinder Kayitha (2014), Fuzzy Logic Based Travel demand model to simulate public transport policies
[15] Tom V Mathew and K V Krishna Rao, (2006) "Trip Generation", NPTEL, pp.7.1- 7.5.
[16] Vaibhav Agrawal and Ashish Verma, (2010) "Trip-end Model for City of Thane- A Comparative Study", Indian Journal of Transport Management, pp.93-110.

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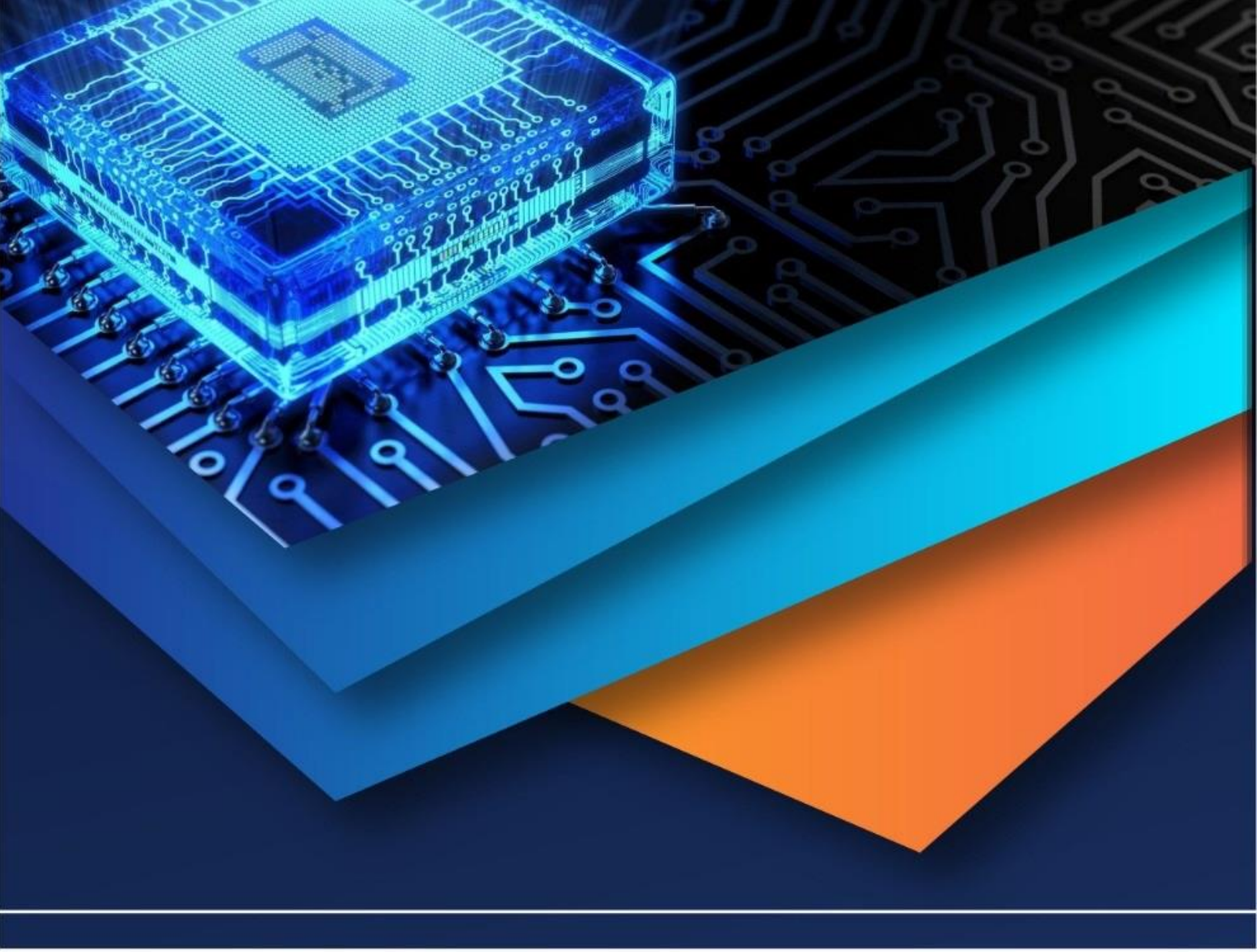

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