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Capacity of Roads – A Review Paper

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Abstract: Capacity estimation plays an important role in designing, planning, and operation of the road network. The traffic is increasing continuously which increases traffic volume more than normal limits. In this review paper, the study is done on the estimation of the capacity of roads. The effects on capacity estimation due to the RoadGeometric conditions, Vehicles types, Traffic conditions, Passenger car unit (PCU). The reason for this review paper is to search out the various effects on the capacity of roads with heterogeneous traffic conditions of India
***Keywords*: Capacity, Passenger car unit (PCU), Road Geometric conditions, Vehicles types.**

I. INTRODUCTION

India is the country with heterogeneous traffic condition which have different types of vehicles like bikes, scooters, trucks, buses, cars, auto, bicycles, etc. which have a huge difference between there static and dynamic characteristics.

As there is a big verity in the physical dimensions and speed of the vehicles it becomes hard to follow, the traffic lanes so vehicles occupy the road space available on that time depending on the traffic conditions. It becomes difficult to calculate the traffic volume of the stream of the road, to measure traffic volume the vehicles with different characteristics are related to it equivalent values with passenger cars, expressed in passenger car unit (PCU). The traffic, road condition, and vehicles affect the capacity of roads. Capacity is outlined as "the most hourly rate at that persons or vehicles is fairly expected to traverse some extent or a consistent phase of a lane or roadway throughout a fundamental measure underneath prevailing road, traffic and management conditions."

II. PAPERS REVIEWED

1) Pothula sanyasi Naidu(2015) et.al. The researcher used a mathematical model which uses IRC specification for analyzing the capacity values of the urban roads, used for finding the standard capacity functions.The relations between cross section and capacity elements are found which derives capacity affecting zones. It will also help in the study on effects on capacity with different width of road elements.The writer used passenger car equivalent (P.C.E) instead of a passenger car unit for road designing. The effect of geometric and road elements is considered for capacity and capacity is to find out with PCE.

2) Rajesh Gajjar and Divya Mohandas (2014) et.al. It is the case study done on urban roads of Mumbai. The survey was carried out on major arterial, sub-arterial and collector roads with video graphic techniques for traffic volume count. The volume count is done off-peak hours in morning and evening hours. It was observed from the study that the calculated volume is more than the designed capacity of the roads. Which is compared with the maximum Road capacity values present in IRC 106-1990 for urban roads to find out the capacity potential of the major roads in Mumbai? In addition, it was observed that being more traffic volume the congestion levels are less.

3) Karuppanagounder Krishnamurthy and Venkatachalam ThamizhArasan (2014) et.al. Researcher represents that the dynamic characteristic of vehicles caused in a moving condition in a traffic stream. The P.C.U values used in this research was used from the Highway Capacity Manual. The P.C.U values vary due to various aspects such as traffic, vehicle, environmental, roadway and control conditions, etc. except vehicular characteristics there are two major factors which affect the P.C.U of vehicles are (i) road width and (ii) traffic volume. The microsimulation techniques are used on the highly heterogeneous traffic roads with the width of 7.5m-11m. in the simulation, this was found that the P.C.U. values changes as the width of road and traffic volume changes.

4) Pratik U.Mankar (2016) et.al. The preliminary survey is carried out to collect the information about geometric features like the number of lanes, shoulder conditions, the width of roads, etc. The traffic survey is carried out to find the data of a selected vehicular volume and vehicular speed at some inner roads section of different selected roads. This field study was done for weekdays on a 30m selected patch, which do not have any intersection between them. The capacity in this study was derived with the help of Greenshields model and the results were compared with Microscopic Simulation Model. In the result, it was observed that the increase in the width of lanes would increase the capacity of the roads.

5) HASHIM Ibrahim Hassan ABDEL-WAHED Talaat Ali (2012) et.al. This study was carried out in Minoufiya Governorate, Egypt on the 12 rural two-lane roads. All the selected sites have tangent elements and horizontal curves. The speed and flow of vehicles were collected at each site. Extrapolation was done from the fundamental diagram of the traffic flow and density to

calculate the capacity. The different types of vehicles were converted to P.C.U. Statistic analysis was used to find the relationships between geometric characteristics and capacity of roads. The best Statistic model was used for capacity at the tangent, capacity at curves and capacity loss between them. In the case of tangents, variables are lane width, shoulder width, and tangent length. In the case of curves, the significant variables are curved radius and width of lanes. The best statistical model to find the relationship between geometry characteristics and capacity loss includes radius curves. This model can also be used to deal with capacity analysis.

6) Mohammad MardaniNokandeh, Indrajit Ghosh and Satish Chandra (2016) et.al. Researcher uses the fundamental concepts of traffic flow theory and finds the capacity of roads by the free-flow speed. It is referred to when the movement of the vehicle is not affected by other vehicles on the roads, in such condition the free speed is used to represent the condition of the roads. The conditions of Indian roads are heterogeneous traffic flow and lane disciplines are not that good which becomes hard for the simulation to apply. The P.C.U is used to convert the heterogeneous condition to the homogeneous conditions. P.C.U values are dynamics and single set, which are not applicable for considering traffic condition for calculating the more data collection. Which can become harder to maintain, time consuming and expensive? The simulation model is used to make this thing easier and increase the accuracy level.

7) DR. SATISH CHANDRA (2004) et.al. This paper helps to find the capacity of two-lane Highway roads with mixed conditions. The data is collected from 40 paths of two-lane roads of the country. The parameters that affect the capacity of two-lane roads under mixed condition are Gradient of roads, Width of lanes, Shoulder width, Slow Moving Vehicles (S.M.V), Pavement surface condition, traffic composition, and directional split. The adjustment factors for each of the parameter is calculated from there condition. Based on this factor the proper procedure is to evaluate the capacity.

III. CONCLUSIONS

After studying various papers on capacity estimation methods and effects on capacity by different condition widely used to analysis are:

1) *Geometric Characteristics:* The geometric characteristics and design elements depend on the parameter, which includes a type of facility number of lanes, a width of the lane, shoulder width, alignments both horizontal and vertical, design speed, and availability of queuing space at intersections.

2) *Traffic Conditions:* Capacity is expressed in terms of units of some congestion on roads (car, people, etc.), so it also depends on the traffic conditions. The types of vehicles in the traffic stream such as the mix of cars, trucks, buses, etc. and the direction of lanes and distribution of lanes the traffic volume on the highway. It includes proportions of turning movements at intersections etc.

3) *Control Conditions:* The types of traffic control conditions in operation, signal directions, the green time, cycle length, and the relationship with adjacent control.

4) The PCU estimates, made through dynamic characteristic for the various types of vehicles of heterogeneous traffic, the PCU value changes with changes in traffic volume.

5) Some of the reasons, which will increase the traffic capacity, are:

a) Technology

b) Better Roads

c) Familiarity of Roads

d) Urban traffic characteristics

e) The capacity values are different from the base capacity values and are nearly equal to the theoretical models.

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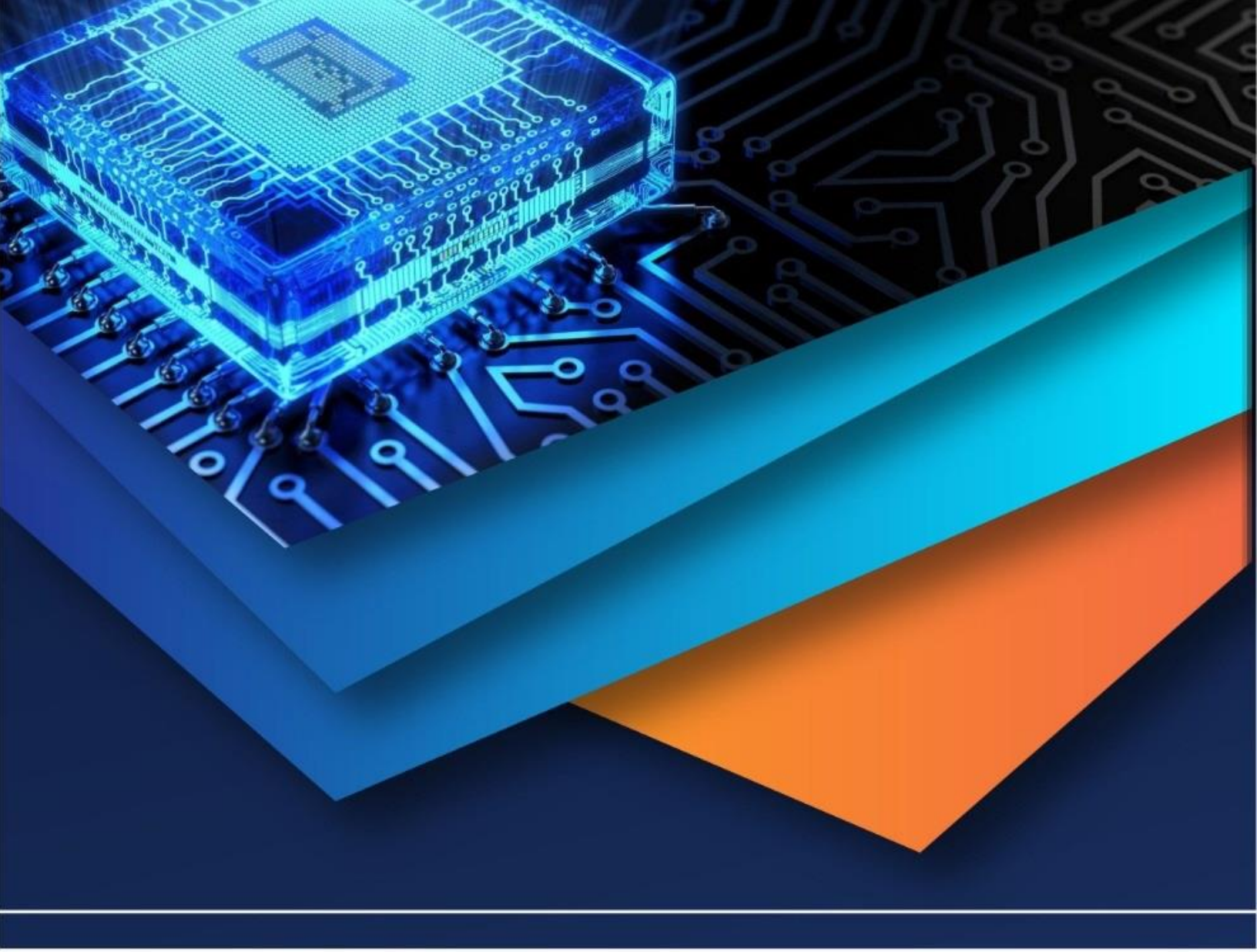

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