

# Comprehensive Traffic Study and Modular Design of Sinhgad Road

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## Abstract

Roads are the arteries of the city. Traffic congestion is like blockage in a city which is very undesirable. Aggravation in traffic congestion reduces efficiency of road. To overcome this, various means and ways are available which are not commonly disclosed. Documentation and data analysis for giving appropriate solution is the main motto of this project. The project deals with the wise application of the various fields in Civil Engineering viz. Transportation, Structural, Project Management and Geotechnical Engineering. The optimized solutions for suffocated Sinhgad Road and civilian around the area will be studied for the same by using appropriate advanced technologies. Objectives involved in this project are comprehensive transportation and techno economic feasibility study, reducing congestion on the route, seeking opportunities to expand mobility options, route rationalization for public transport, minimizing adverse impacts on the traffic mobility. The strategic action plan for this will include defining work area, plotting station points, traffic survey, and relevant data collection, finalization of transport models, planning and designing models and will be summarized in the form of prototype. The work is beneficial for reducing travel time, traffic congestion and making public transport efficient. It will also improve the utility of existing traffic management

## I. INTRODUCTION

The population on sinhgad road is tremendous. The increase in personalized vehicles coupled with slow growth in the PMPML fleet has reduced the share of public transportation trips. The three wheelers are also a big chaos creating equipment on road. The development plan for sinhgad road is valid till 2021. The recent development cannot be changed altogether. Making changes in the current situation. Sinhgad road has very less access points connecting the other parts of the city. So other than Rajaram bridge there are very few SITS, Department of Civil Engineering 2019-20 2 options to connect to other part of the city. This factor forces the commuters to take sinhgad road itself. The road width of sinhgad road varies tremendously in between 30m to 50m. the illegal constructions due to unplanned development and lack of authorities to take control are adding to the mess. Cycle tracks and footpath that are present on some length of the road are occupied by small vendors. Hence the pedestrian and cycle traffic become part of the main road. New developments are in progress in newly added part of the villages. Thus, heavy trucks, cranes etc. have also started to take this route. Increase in the traffic volume due to various reasons such as rapid growth on both sides on sinhgad roads, rapid increase in population, aleatory construction, inefficient public transport is causing major traffic congestion on sinhgad road. This project defines the problems, examines the problems closely and proposes solutions to dilute these problems.

## II. OBJECTIVES

- A. To study the Comprehensive traffic, transportation and techno-economic feasibility of Sinhgad road.
- B. To build a strong database detailed element of congestion on route.
- C. To seek opportunities to expand mobility options.
- D. Route rationalization.
- E. To emphasize safety in all elements of road transportation.

## III. LITERATURE SURVEY

- A. **V. Thamizha Arasan, K. Krishnamurthy** he study that Study of the effect of traffic volume and road width on PCU value of vehicles using Microscopic simulation. The knowledge of traffic volume is very important for planning, analysis and operation uniform measure. This will help in calculating the loads while designing traffic module
- B. **Maitra et al [2004]** Modelling Traffic Impact of Flyover at an Urban Mixed Traffic Environment. In the present paper the traffic impact of a flyover along with an adjacent intersection has been analyzed, by using a simulation model developed for mixed traffic operations and poor lane discipline prevailing in India. The locations for the flyover have been decided based on the present-day operation conditions **Relevance:** For determination of exact locations of flyover to bypass the traffic is determined in this paper.
- C. **A. V. Arjun et al[2013]** Economic Feasibility and Efficient Project Scheduling of Fly-Over in Visakhapatnam, India. The Construction of flyover in major cities due to heavy traffic is very essential in the present-day scenario in order to reduce fuel consumption, accidents and travel time. Based upon the benefits acquired and construction cost of the flyover, feasibility study has been done. The flyover construction scheduling is carried out through different stages of construction. The construction period and cost are worked out for two different stages of construction. **Relevance** The studies carried out to construct a traffic module were majorly acquired from this paper.
- D. **M. S. Nimbalkar et al** Urban Transportation Problems in a Million City: A Case Study of Pune Urban Area. There is a huge potential to develop existing public transport facilities with the help of modern technology like skyline bus, monorail GPS Navigation System. Population growth is occurring exponentially in Pune city. So, the rearrangement of the transportation facilities systematically with help of innovative ways of transportation is needed. **Relevance:** The rearrangement and development of public transportation system is acquired from this paper.
- E. **Abhishek.A. Hirulkar et al [2018]** Traffic Volume Measurement of Pune University Road to Paud Phata: Case Study Traffic condition in most of the cities are very chaotic and crucial. This is particularly observed in million plus, cities. As the urbanization process takes momentum, these problems crop up due to the lake of commensurate development of infrastructure, particularly roads. Traffic volume survey is carried out for each intersection of selected route which is converted into PCU by multiply by PCU equivalent factor. **Relevance:**

To measure hourly traffic volumes in terms of passenger car unit and note other related traffic characteristics.

- F. **P. S. Kharola et al** Indian Institute of Technology, Delhi Traffic Safety and City Public Transport System: Case Study of Bengaluru, India. Vehicle crashes are a major concern in rapidly growing urban agglomerations. They also have attracted the attention of researchers, academicians, and policy makers. A large body of research literature exists that throws light on the magnitude of this prob and also indicates the interventions required. In most of the Indian cities, buses are the main mode of public transport. An externality of the bus-based public transport system, like any other mode of transport, is the injuries and fatalities arising out of the crashes involving them. as we know Buses are involved in 12-20 percent of fatal crashes in Indian cities. This paper presents that an analysis of the fatal crashes that involved public transport buses in Bengaluru, India. This paper confide that low floor buses with mechanical doors and segregated pedestrian and bicycle lanes can have a major impact on reducing fatal crashes of bicycles and pedestrians involving buses. Relevance: This paper presents an analysis of the fatal crashes that involved public transport buses in Bengaluru.
- G. **Pallavi A. Mandhare et al [2018]** Intelligent Road Traffic Control System for Traffic Congestion Ever increasing population growth in urbanization because of migration from rural to urban and economic expansion has made an on the rapid increase in vehicle population. It puts a huge amount of pressure on transportation infrastructure and particularly on traffic management practices in cities and town of the urban area. Based on this worldwide best practices observed in countries like the USA, Dubai, Canada, United Kingdom etc., the ITS application appears to be providing promising solutions for traffic control and management. In this paper, we just tried to explore the world of ITS and an efficient model can be designed by an integrated approach with a number of sensors and technologies. On the other hand, each technology has its own limitations.

## V. RESULT AND DISCUSSION

### *Traffic Survey:*

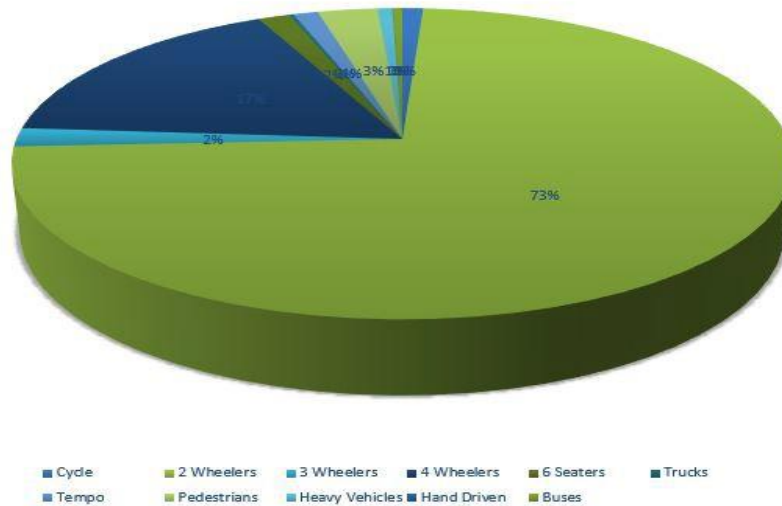
As we know Traffic Survey is a detailed study of the traffic conditions of an area or Section with a view to assessing the traffic prospects and the financial implications of new projects, restorations, other traffic facilities. Traffic Survey attempts to arrive at an assessment of the total traffic currently present at the location and also the traffic likely to be generated in the foreseeable future.

The traffic Survey Data for the Junctions are given below in tabular as well as pie-chart form.

| Time            | 8 to 9 | 9 to 10 | 10 to 11 | 11 to 12 | 12 to 1 | 4 to 5 | 5 to 6 | 6 to 7 | 7 to 8 | 8 to 9 |
|-----------------|--------|---------|----------|----------|---------|--------|--------|--------|--------|--------|
| <b>Vehicles</b> |        |         |          |          |         |        |        |        |        |        |
| Cycle           | 78     | 99      | 94       | 101      | 165     | 37     | 143    | 132    | 134    | 67     |
| 2 wheelers      | 7498   | 8487    | 8441     | 8046     | 8321    | 8014   | 7577   | 6725   | 6889   | 6545   |
| 3 wheelers      | 401    | 573     | 424      | 237      | 398     | 487    | 578    | 595    | 481    | 509    |
| 4 wheelers      | 1059   | 1419    | 1718     | 1809     | 2095    | 1857   | 1978   | 1738   | 2323   | 2567   |
| 6 seaters       | 477    | 573     | 897      | 749      | 696     | 456    | 501    | 545    | 620    | 561    |
| Trucks          | 26     | 10      | 100      | 126      | 198     | 126    | 78     | 98     | 93     | 107    |
| Tempo           | 65     | 15      | 127      | 137      | 148     | 93     | 105    | 100    | 75     | 62     |

|                      |     |     |      |      |      |      |      |      |      |      |
|----------------------|-----|-----|------|------|------|------|------|------|------|------|
| Pedestrians          | 437 | 527 | 1716 | 1926 | 2015 | 1986 | 1903 | 1325 | 2010 | 1431 |
| Heavy vehicles       | 98  | 41  | 328  | 401  | 347  | 47   | 156  | 100  | 105  | 56   |
| Hand driven Vehicles | 2   | 3   | 4    | 1    | 3    | 2    | 2    | 3    | 1    | 2    |
| Buses                | 78  | 93  | 102  | 104  | 137  | 127  | 167  | 155  | 167  | 103  |

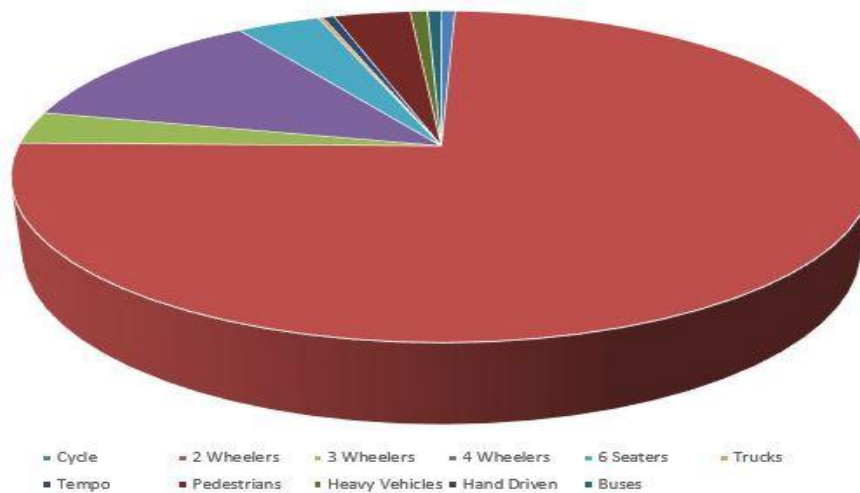
**Table: Traffic Survey Data for various timings on Santosh hall junction.**



**Fig.1. Pie-Chart Showing the percentage of various vehicles.**

| Time                 | 8 to 9 | 9 to 10 | 10 to 11 | 11 to 12 | 12 to 1 | 4 to 5 | 5 to 6 | 6 to 7 | 7 to 8 | 8 to 9 |
|----------------------|--------|---------|----------|----------|---------|--------|--------|--------|--------|--------|
| <b>Vehicles</b>      |        |         |          |          |         |        |        |        |        |        |
| Cycle                | 59     | 75      | 71       | 76       | 124     | 28     | 78     | 99     | 101    | 51     |
| 2 wheelers           | 5624   | 6365    | 6331     | 6035     | 6241    | 6011   | 5683   | 5044   | 5167   | 4909   |
| 3 wheelers           | 301    | 403     | 318      | 177      | 299     | 366    | 434    | 447    | 361    | 382    |
| 4 wheelers           | 759    | 1065    | 1289     | 1357     | 1572    | 1393   | 1484   | 1304   | 1743   | 1926   |
| 6 seaters            | 358    | 430     | 673      | 561      | 522     | 342    | 376    | 409    | 465    | 421    |
| Trucks               | 20     | 8       | 75       | 95       | 149     | 95     | 59     | 74     | 70     | 81     |
| Tempo                | 49     | 12      | 96       | 103      | 111     | 70     | 79     | 75     | 57     | 48     |
| Pedestrians          | 328    | 396     | 1287     | 1445     | 1511    | 1490   | 1428   | 994    | 1507   | 1074   |
| Heavy vehicles       | 74     | 31      | 254      | 301      | 261     | 36     | 117    | 75     | 79     | 42     |
| Hand driven Vehicles | 1      | 2       | 3        | 2        | 2       | 2      | 1      | 2      | 2      | 2      |
| Buses                | 67     | 91      | 97       | 99       | 126     | 121    | 163    | 149    | 157    | 96     |

**Table: Traffic Survey Data for various timings on Manik Baug junction.**



**Fig.2. Pie-Chart Showing the percentage of various vehicles**

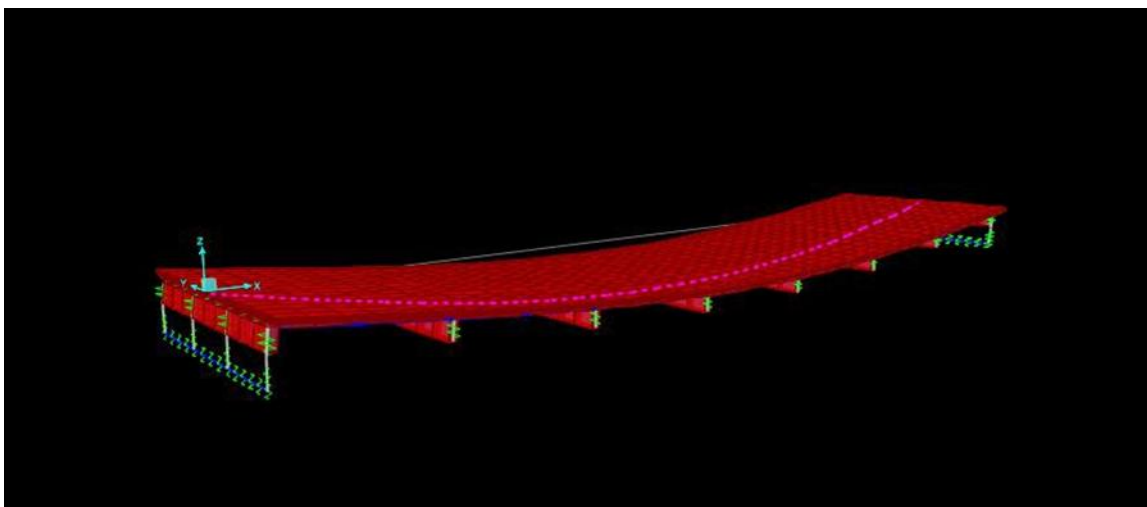
**Design of Bridge Using SAP2000 V15 Software: -**

SAP2000 is the general purpose software used to analysis and design of any type of structural system. Basic and advanced systems, ranging from 2D to 3D, of simple geometry to complex, may be modeled, analyzed, designed, and optimized using a practical and intuitive object- based modeling environment that simplified and streamlines the engineering process. SAP2000 is the ideal software tool for users of any experience level, designing any structure system.

SAP series of Structural Analysis Programs. Bridge designers can also use SAP2000 Bridge templates for generating Bridge models, Automated Bridge Live Load Analysis and Design, Bridge Base Isolation, Bridge Construction Sequence Analysis, Large Deformation Cable Supported Bridge Analysis and Pushover Analysis.

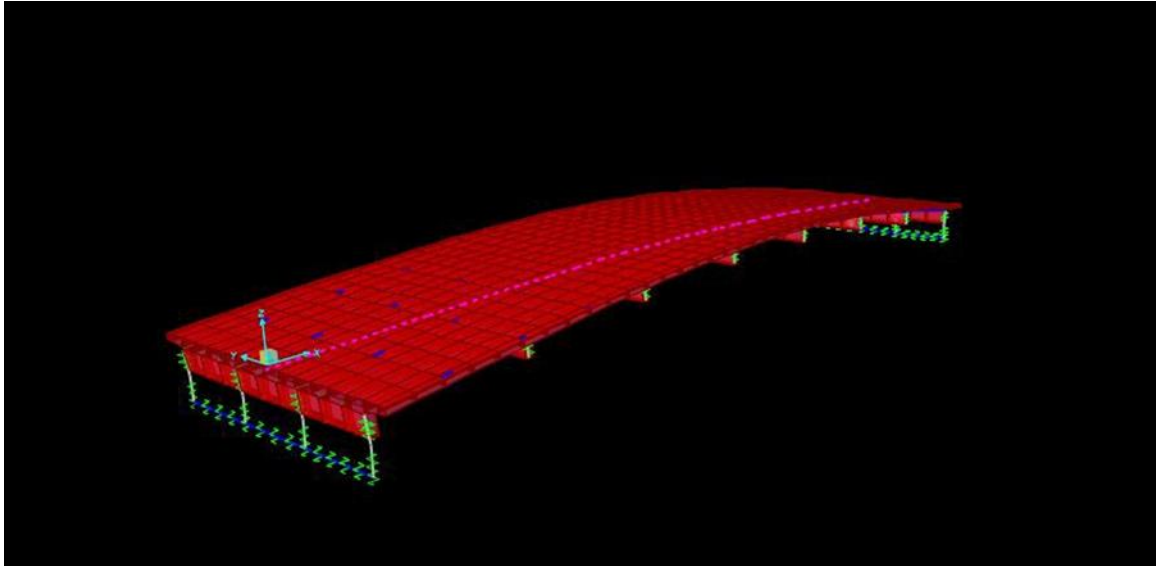
The deformed Shapes of the designed span of the bridge is shown below for various cases of loads. The deformed Shapes of the designed span of the bridge is shown below for various cases of loads.

1. Deformed Shape for dead load case:



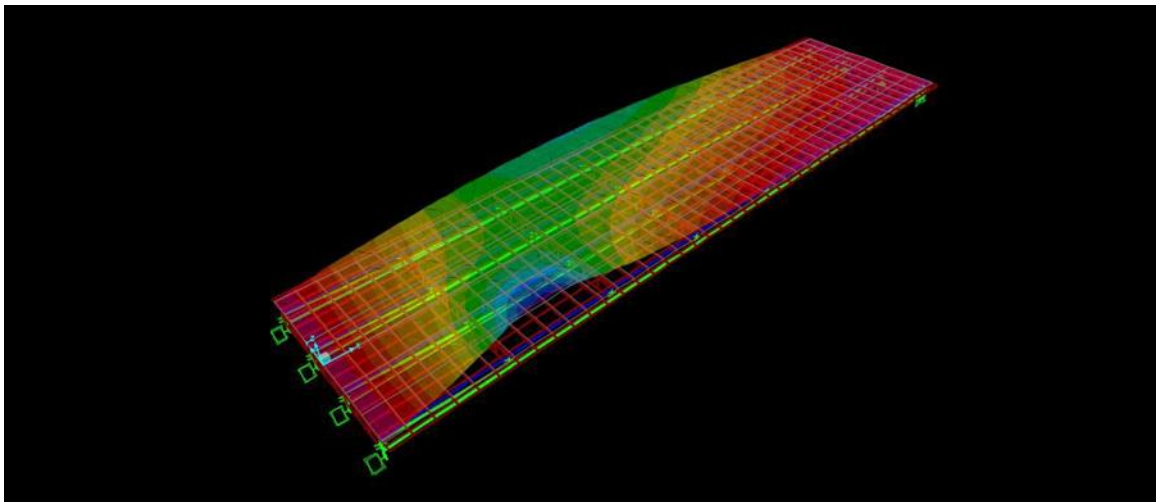
**Fig.3. Deformed Shape for dead load case**

2. Deformed Shape for Tendon Load:



*Fig.4. Deformed Shape for Tendon Load*

3. Deformed Shape for Combination of Loads:



*Fig.5. Deformed Shape for Combination of Loads*

PSC Bridge doesn't require any kind of formwork and thus it reduces the cost for placing and removing the formwork. PSC also is constructed in a speedy manner. Hence it reduces the overall cost of construction. Sinhgad road being a busy and congested road, it has been decided to construct a Prestressed Concrete (PSC) bridge. PSC bridge reduce the time of construction and thus the cost of construction. Also, it has been decided to use Reinforced Earth Work (REW) as approach.

### ***Relocation of The Bus Stops:***

The bus stops are situated immediately after crossing a junction. After the bus crosses the junction, it stops immediately after the junction. As the road width is less, the bus occupies the most of it thus increasing a traffic block. According to IRC, the bus-stops should be located 75m away from traffic signal. Relocation of bus stops will help in free flow of the traffic. In the new proposal, the bus stops are situated at least 75m away from the traffic signals. Thus, the bus halting at the bus stop will not obstruct the free flow of the traffic thus avoiding congestions

## **IV. CONCLUSION & FUTURE SCOPE**

- Providing Flyover- It was observed that providing flyover will bypass the traffic from main two junctions. This will help in reduction of the congestion thus solving the main problem. Design of the flyover for the defined study area has been undertaken. The design details as explained previously play an important role in the development of the road thus making it more congestion free to travel. Flyover has been designed for the most congested area on Sinhgad road thus helping the traffic to bypass.
- Providing an island at Manikbaug Chowk- Traffic is very irregular at this junction. Providing a divider circle in between will force the commuters to use the specified space itself reducing mess caused due to the wrong side travelling of the commuters. Regulation of traffic is proposed with the help of this island. Design details of the same are as depicted in the figure.
- Relocating of bus-stops- The bus stops are situated immediately after crossing a junction. After the bus crosses the junction, it stops immediately after the junction. As the road width is less, the bus occupies the most of it thus increasing a traffic block. According to IRC, the bus-stops should be located 75m away from traffic signal. Relocation of bus stops will help in free flow of the traffic. In the new proposal, the bus stops are situated at least 75m away from the traffic signals. Thus, the bus halting at the bus stop will not obstruct the free flow of the traffic thus avoiding congestions.

### ***Future Scope of Work:***

- Avoiding Traffic congestion—Traffic congestion is the main problem faced on the road. So, the main proposal will be with regard to traffic congestion:
  - a. Many small lines are connected to the main road restricting entries from the lanes to the main road using one-way traffic movement will help channelize the traffic flow and will reduce the chaos at the junction of the lane and the main road.
  - b. Providing ring roads- there are many alternative roads in the development plan which are not built due to different reasons such as the people of the area have objected to the development, court stay orders etc. These roads can be developed by sorting the issues hence providing a bypass to traffic of a particular area.
- Pedestrian safety-
  - a. Providing skywalks - At major points where the pedestrian movement is high, skywalks can be provided.
  - b. Providing subways- subways are a good option for pedestrian movement in the junction.

- Controlling Encroachment-  
The vendors from the various nearby villages occupy the footpaths and cycle tracks which is illegal. This encroachment is rampant and uncontrolled. Making spaces in the adjoining area for the vendors will be focused.
- Traffic Management
  - a. Improving public transport- Frequency of buses and the various available routes of the buses were studied and suggestions to the PMPML authorities will be given to improve the conditions which will ensure safe and fast transport
  - b. Improving public transport- Frequency of buses and the various available routes of the buses were studied and suggestions to the PMPML authorities will be given to improve the conditions which will ensure safe and fast transport.
- Avoiding unauthorized hoardings and relocation of feeder pillars-  
Political hoardings are put up wherever it is possible to put. This often comes between the vision of the driver. This leads to accidents many times. Feeder pillars are placed in the foot paths and cycle tracks. This causes the cyclists and the pedestrian to use cycle tracks and pedestrian roads.

## AKNOWLEDGEMENT

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## REFERENCES

- [1] V. Thamizha Arasan, K. Krishnamurthy “Study of the effect of traffic volume and road width on PCU value of vehicles using Microscopic simulation” J. Transp. Eng. 2010.136:1110-1119.
- [2] B. Maitra, M. Azmi, N. Kumar, J. R. Sarkar. “Modelling Track Impact of Flyover at an Urban Mixed Traffic Environment” European Transport \ Trasporti Europei n. 27 (2004): 57-68
- [3] A. V. Arjun, Dr. L. Venkat and V. M. Naidu “Economic Feasibility and Efficient Project Scheduling of Fly-Over in Visakhapatnam, India” ISSN: 2278-0181 Vol. 2 Issue 3, March - 2013
- [4] Urban Transportation Problems in a Million City: A Case Study of Pune Urban Area: M. S. Nimbalkar, Dr. V. R. Nagarale, Dr. D. H. Harpale. International Research Journal—ISSN-0974-2832
- [5] Mr. Abhishek.A.Hirulkar, Mr.Tanay.S.Jaiswal, Mr. Shankar.B.Kivade, Miss. Monica. G.Shewade, Miss. Dheeraja.S.Shirke, Mr. K. V. Mhetre. “Traffic Volume Measurement of Pune University Road to Paud Phata ” e-ISSN: 2395-0056 Volume: 05 Issue: 05 | May-2018
- [6] P. S. Kharola, Geetam Tiwari, and Dinesh Mohan Indian Institute of Technology, Delhi. “Traffic Safety and City Public Transport System” Journal of Public Transportation, Vol. 13, No. 4, 2010
- [7] Pallavi A. Mandhare 1\* , Vilas Kharat 2 , C.Y. Patil 3 “Intelligent Road Traffic Control System for Traffic Congestion: A Perspective ” Vol.-6, Issue-7, July 2018 E-ISSN: 2347-2693