International Journal of Scientific Research in Civil Engineering
© 2021 | IJSRCE | Volume 5 | Issue 4 | ISSN : 2456-6667

# Analysis of a Commercial Structure Utilizing Analysis Tool Staad.Pro

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## ABSTRACT

**Article Info**
Volume 5, Issue 4
Page Number : 23-29

**Publication Issue :**
July-August-2021

**Article History**
Accepted : 01 July 2021
Published : 08 July 2021

Now a days multi-storey buildings constructed for the purpose of residential, commercial, industrial etc., with an open ground storey has become a common feature. For the sake of parking, the ground storey is kept free without any constructions, except for the columns which transfer the building weight to the ground. For a hotel or commercial building, where the lower floors contain banquet halls, conference rooms, lobbies, show rooms or parking areas, large interrupted space is required for the movement of people or vehicles. The columns which are closely spaced in the upper floors are not advisable in the lower floors. So to avoid this problem, floating column concept has come into existence The examination was centered around breaking down the impacts of coasting segments when upheld on different example of shafts in a G+6 story structure in thinking about seismic zones III and delicate soil condition utilizing Staad.Pro.v8i. The investigation of skimming segments was finished considering the boundaries to be specific the base shear, story uprooting, story float and story speed increase concerning subject multi-story structure with various situation of supporting pillar just beneath the gliding segments.

Keywords : Floating columns, STAAD.Pro, Story drift, Base shear, Story displacement

## I. INTRODUCTION

In urban areas, multi storey buildings are constructed by providing floating columns at the ground floor for the various purposes which are stated above. These floating column buildings are considered safe under gravity loads and hence are designed only for those loads. But these buildings are not designed for earthquake loads and therefore, these buildings may be unsafe in seismic prone areas. When the floating columns are employed in buildings in seismic prone areas, the entire earthquake of the system is shared by the column or the shear walls without considering any contribution from the floating columns.

In this investigation we are examining a G+6 structure with blended utilization of land i.e lower floors for business and rest above are private. Using Ground and first floor for stopping and business use separately. For this we need huge range and area of section ought to be to such an extent that it doesn't deterred the above floor prerequisite .yet under some situation there is a need to end the segment at certain floor and make new segment from bar to help the above structure.

## II. LITERATURE REVIEW

**Kapil Dev Mishra and Dr A. K. Jain (2018)** the exploration paper considered investigation of a multi celebrated Plaza working of story (G+2+3) having diverse situation of gliding sections (4 segments of mid ordinate hub or 4 segments of corner to corner hub) at various tallness of working (at the level above second floor) at two distinct zones (ZONE III and ZONE IV). The arrangement space of moving toward second floor was 30m×30m or more this floor region was decreased to 20m×20m. Stature up to second floor of the structure was utilized for stopping or business shops having floor tallness of 4m or more this it was utilized for private and office reason. Skimming sections was given at office floor.

The outcomes expressed that Maximum Bending Moments just as Maximum Support Reaction for the constructions having gliding sections was higher than that of designs without coasting segments. Most extreme Bending Moments at seismic Zone IV was more prominent than that of Zone III. Designs having skimming segment developed in Zone IV was more influenced by seismic tremor than Zone III.

**Waykule .S.B et al (2017)** the examination paper introduced static investigation for a multi-story working with and without drifting sections. Various instances of the structure was introduced by shifting the area of coasting segments floor insightful. The primary reaction of the structure models concerning, Base shear, and Story removals was researched. The investigation was completed utilizing programming sap2000v17.

The outcomes expressed that base shear diminished on first floor because of presentation of drifting section in contrast with structure without coasting segment. Dislodging was most extreme at every story with skimming segment in contrast with structure with customary sections.

### Objectives of the study

The main objectives of this study is to evaluate the performance of floating column building. Followings are the specific objectives of this study.

1. To study the behavior of mid rise structure with floating columns.
2. To determine the effect of seismic forces over a mid rise structure with three different floating column conditions.
3. To determine the utilization of analysis tool staad.pro in analysis of tall structures.
4. To determine the cost effectiveness of floating column structure with three different boundary conditions.

## III. Methodology

In this study we are adopting followings steps one by one to complete the study:

### Step-1

In this step we reviewed publications and research works available on citations and in google scholar to review them briefly to prepare our study scope and boundary conditions.

### Step-2

In this step we started preparing geometry of all the three cases considered in this study where we are considering same geometry with different boundary and floating column support conditions using structure wizard tool in staad.pro

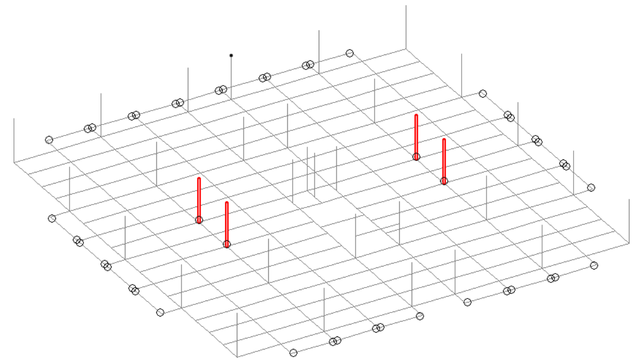


Fig a: Case I (Floating column supported on beam at regular interval)

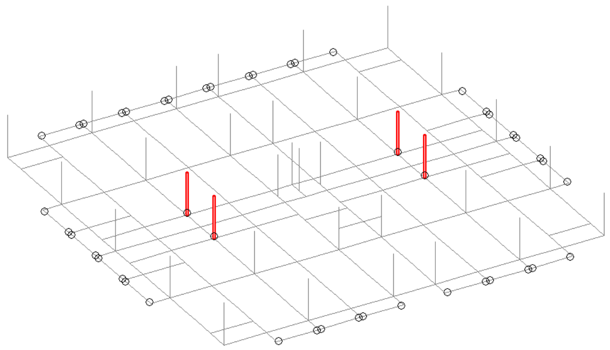


Fig b: Case II (Floating column supported on beam at Perpendicular direction)

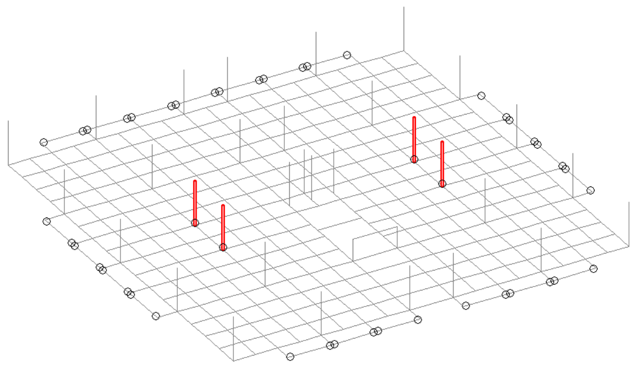


Fig c: Case III (Floating column supported on Closely Supported beams in both directions)

**Fig 1:** Plan of structures

**Step-3:** Assigning material descriptions and member sizes to the structure using property wizard in staad.pro

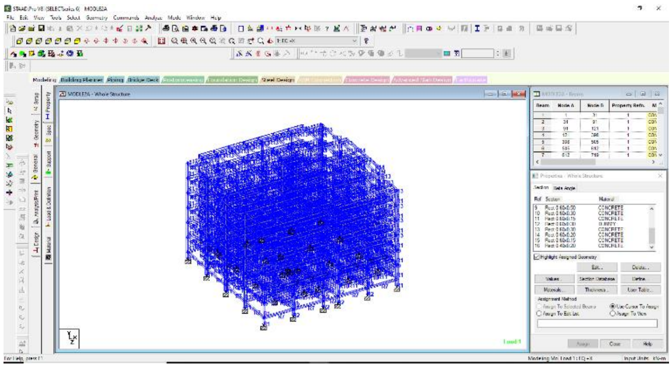


**Fig 2 :** Material and size of structural members

**Step-4: Assigning fixed end & moment release support condition to the structure.**

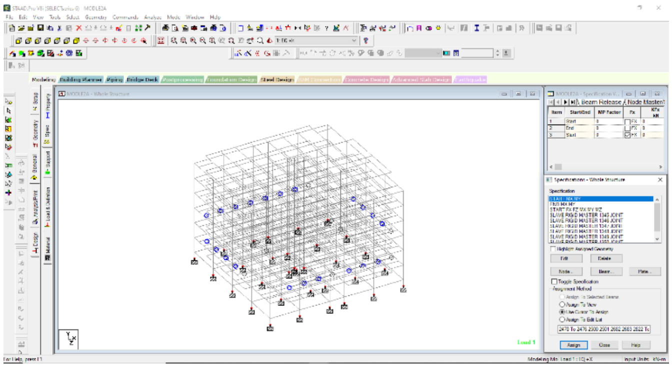


**Fig a: Moment Release at supported beams**

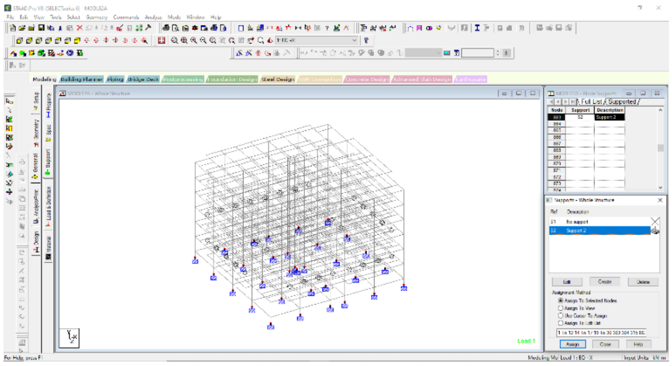


**Fig b: End Conditions**

**Fig 3 :** Support Condition

**Step-5: Defining Load conditions as per Indian Standards**

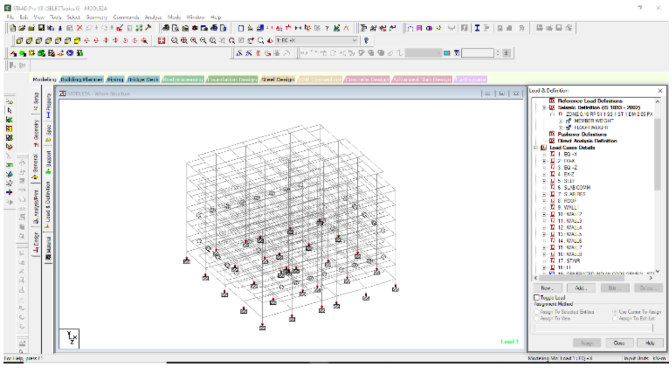


**Fig 4 :** Defining Load conditions

**Step-6: Performing Analysis**

In this comparative analysis we have performed seismic analysis of structures considering seismic zones III and soft type of soil. In this study we are performing finite element analysis.

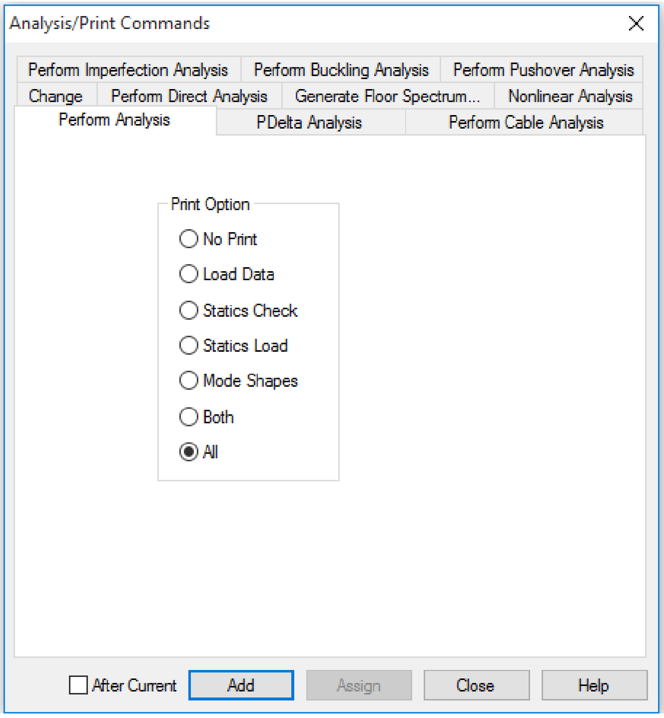



**Fig 5 :** Analysis of the structure

Step-7: Analyzing results in terms of forces, moment and displacement.

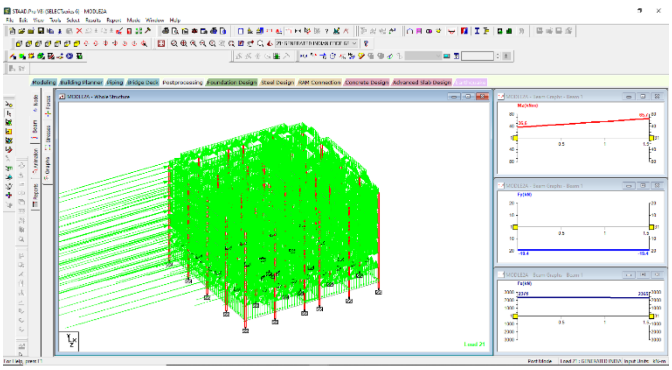


**Fig 6 :** Analysis output

**Cases considered in this study are**

Case I: Floating column supported on beam at regular interval.

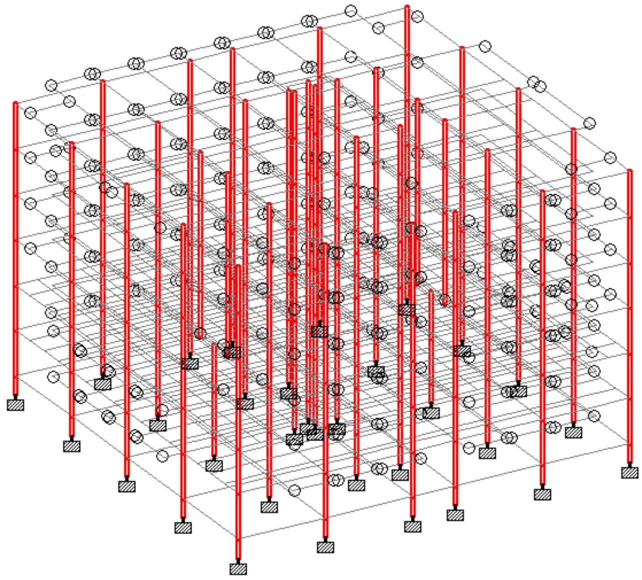


Fig a : Case I

Case II: Floating column supported on beam at Perpendicular direction

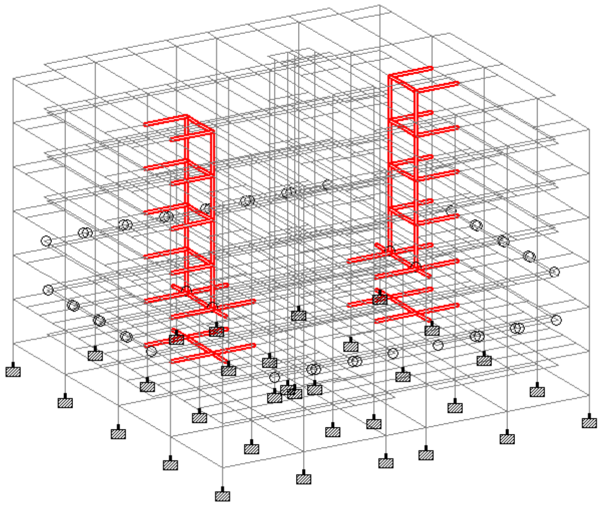


Fig b : Case II

Case III: Floating column supported on Closely Supported beams in both directions

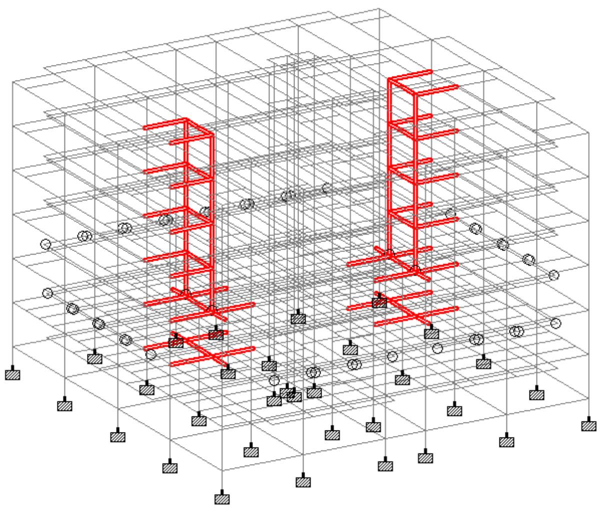


Fig C : Case III

**Fig 7 :** Cases considered for analysis

**Geometrical description**

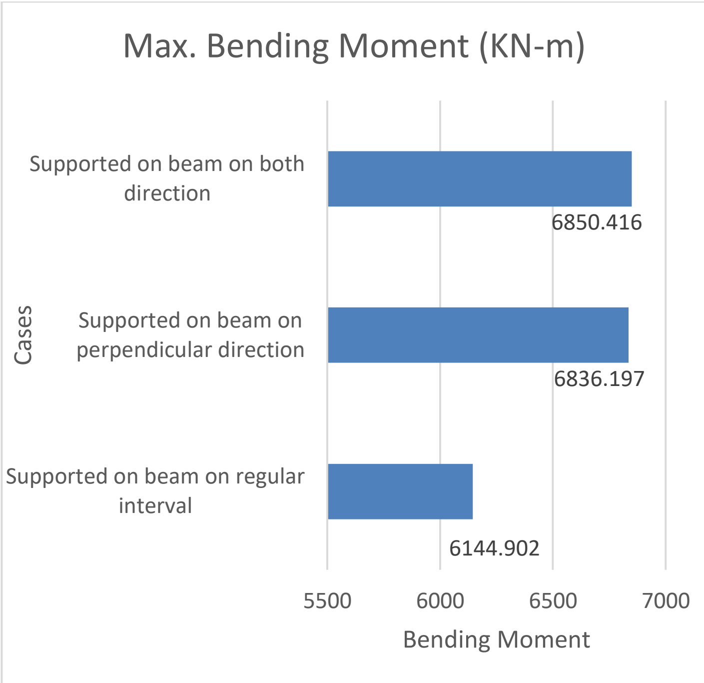
The geometric parameters of structure are shown in Table 1.

**Table 1** Geometric parameters of case study

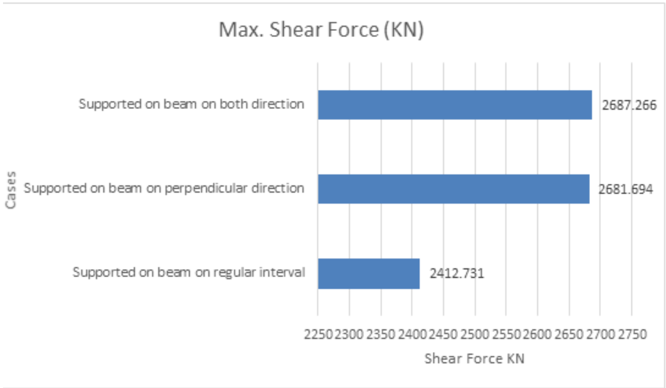
| S. No. | Description | Value |
|---|---|---|
| 1 | Area of building | 1036.80 $m^2$ |
| 2 | Length | 32.4 m |
| 3 | Breadth | 32 m |
| 4 | Storey height | 3.6 m |
| 5 | Height of the column below plinth level | 1.5 m |
| 6 | Size of the outer column | 600 mm x 400 mm |
| 7 | Size of the 2 column at exterior | 600 mm x 600 mm |
| 8 | Size of the 4 interior column | 300 mm x 600 mm |
| 9 | Size of the 3 columns located at same plane | 300 mm x 220 mm |
| 10 | Size of the 1 column located at interior centre | 380 mm x 300 mm |
| 11 | Size of beam for Plinth level | 500 mm x 300 mm |
| 12 | Size of beam for first & second level | 600 mm x 500 mm |
| 13 | Size of beam for Closely supported | 600 mm x 300 mm |
| 14 | Size of beam for perpendicular supported | 600 mm x 150 mm |
| 15 | Size of beam for center C shape | 600 mm x 300 mm |
| 16 | Size of beam for 3 level above level | 600 mm x 300 mm |
| 17 | Size of beam for perpendicular beam | 400 mm x 200 mm |
| 18 | Support condition | Fixed End |

## IV. ANALYSIS RESULTS & DISCUSSION

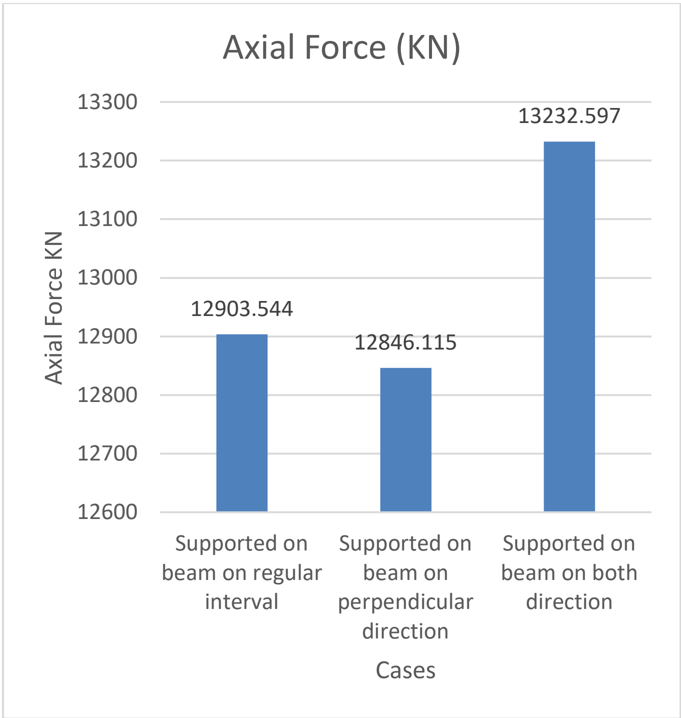
**Bending Moment (KN-m)**



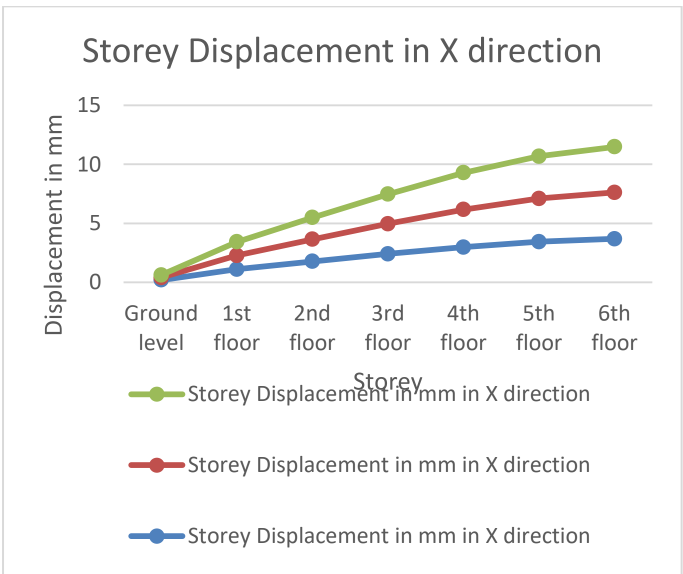

**Graph 1 :** Bending moment




**Graph 2 :** Shear force KN




**Graph 3 :** Axial force




**Graph 4 :** Displacement in mm

## V. CONCLUSION

In present work we are looking at three changed states of coasting section where it is upheld on various game plans of pillars.

In this investigation we presumed that solidness of construction with gliding sections upheld on normal stretch pillars are generally appropriate in correlation while instance of drifting segment upheld on radiates on opposite course second most reasonable sort though case skimming segment upheld on both bearing shafts are showing most noticeably terrible outcomes.

In terms of economy we can presume that case I is similarly most efficient one in examination as twisting second saw for this situation is relatively less which brings about less prerequisite of space of steel.

Here it is seen that all cases are under allowable constraint of relocation according to I.S. 1893-I:2016 henceforth giving security under seismic stacking.

Unbalanced powers are noticed 11.3% more on the off chance that III when contrasted with case I, accordingly coming about greater solidness to case I in examination.

In terms of vertical pressing factor case III is showing minimal more worth in comparion to different cases however variety is practically neglible.

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**Cite this article as :**

Vijay Singh Dasoondi, Rahul Satbhaiya, "Analysis of a Commercial Structure Utilizing Analysis Tool Staad.Pro", International Journal of Scientific Research in Civil Engineering (IJSRCE), ISSN : 2456-6667, Volume 5, Issue 4, pp.23-29, July-August.2021
URL : https://ijsrce.com/IJSRCE21541