iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 Issue: III Month of publication: March 2018

DOI: http://doi.org/10.22214/ijraset.2018.3049

Comparitive Study of Trusses using Staad-Pro Software

Prof. Mohd Azaz[1], Shaziya Ansari[2], Afrin Khanam[3], Saima Anjum[4], Shahbaz Bano[5]
[1, 2, 3, 4, 5] Civil Engineering, Rtmnu, Acetnagpur, Maharashtra,

Abstract: Steel roof trusses have a broad range of applications in construction industry owing to their various advantages comprising of good load transfer mechanism without compromising with the structural appearance. Steel is usually considered over any other building material for making of trusses, since structural steel is durable and can be well moulded to give desired shape to the structure. In the present study, analytical results of three different steel truss models are compared using STAAD-Pro software. The requirement of this study arises when sometimes it becomes difficult to choose an effective truss shape or truss geometry during the design period. Comparison of different parameters has been made in the form of graphical representation. The present paper shows the comparative graphs of displacement, shear force and bending moment against loading (calculated as per SP 38)of all the three models. The results are compared to obtain the optimum and most efficient truss model.
Keywords: Structural steel, Truss, STAAD-pro, Shear force, Bending moment, Displacement.

I. I.INTRODUCTION

The steel roof truss is one of structural engineering's most important and intricate structure. In structural and architectural engineering, a truss is essentially a triangulated system comprising of straight interconnected structural elements. The members carry equal counteracting tensile and compressive forces. The most basic shape of truss is that of a triangle having two side lateral elements and bottom horizontal chord. Normally, the lateral sides are under compression and bottom chord under tension during the service life of the truss structure. The interior members called as webs or webbings are combined to form a simple system of triangles creating equilibrium of forces within the truss system. This is because triangle is an inherently stable and rigid structure in itself. When pinned/connected at the nodes, truss is capable of taking sufficient load and transfer it to the supports below.
Trusses are classified as under:

A. Perfect trusses (m= 2j-3).
B. Deficient Trusses (m< 2j-3).
C. Redundant Trusses (m>2j-3).

Where, m = members, j =joints
Steel trusses have a wide range of uses in modern engineering works like bridges, industrial sheds and other commercial high rises. Nowadays, steel roof trusses are used for strength as well as for good aesthetic appeal. Trusses are lightweight, their installation is easy and hassle free and the expenses can be predetermined.

II. STAAD- PRO

In the present paper, STAAD-Pro software is adopted for analysis of truss models. STAAD-Pro is a structural analysis and design computer program which was originally developed by Research Engineers International at Yorba Linda, CA in 1997. STAAD- Pro is one of the most widely used structural analysis and design software. It has great advantages being a user friendly software. This is professional's first choice for model generation, analysis, visualization and result verification. In addition, it gives necessary warnings for structural improvement. Owing to its various advantages, the software is used for present paper work.

III. OBJECTIVES

The objectives of study are:

A. To study the behaviour of each truss model under given loading conditions.
B. Comparing strength parameters which are axial force, shear force and bending moment of truss models under provided loading.
C. Selection of the best working model of truss among the three models.
D. To study the structural response of the trusses with respect to the following parameters-

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com

1) Deflection.
2) Shear force.
3) Bending moment.
4) Axial forces.

IV. MODEL STUDIES

A building of plan size 12m*36m was selected for study. Three properly configured truss models were selected to be compared and the most efficient to be selected for the proposed building plan. Rise (h), slope angle (ϴ) and spacing between intermediate trusses were kept same for each model to establish similarity in analysis. Loading on each truss was calculated with reference to SP 38, IS 875 part 2.

V. SELECTED MODELS

A. Loading Details

1) Model 1

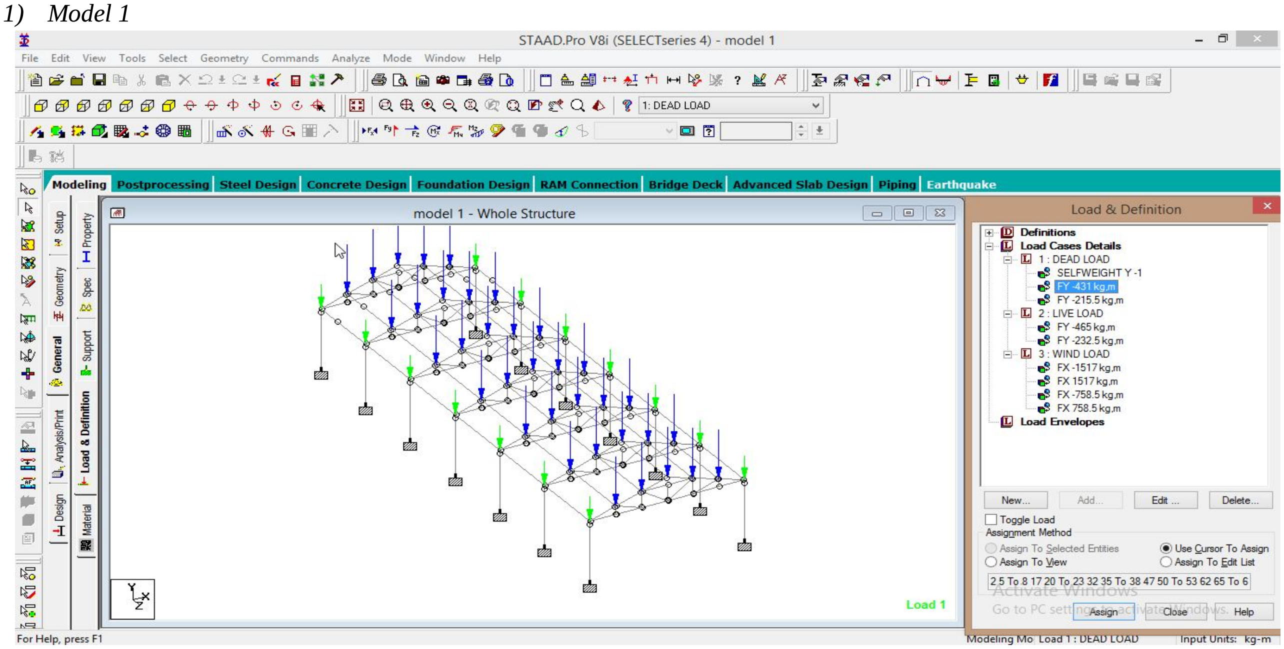


Fig No. 1 shows loading details of model no.1

2) Model 2

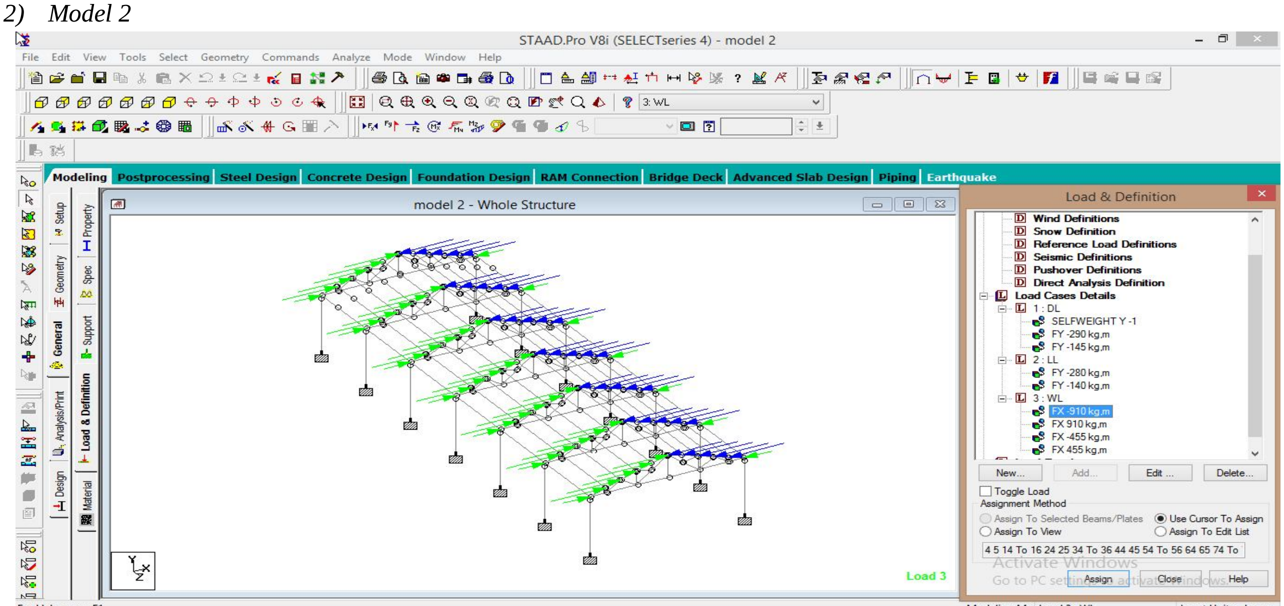


Fig No.2 shows loading details of model no.2

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com

3) Model 3

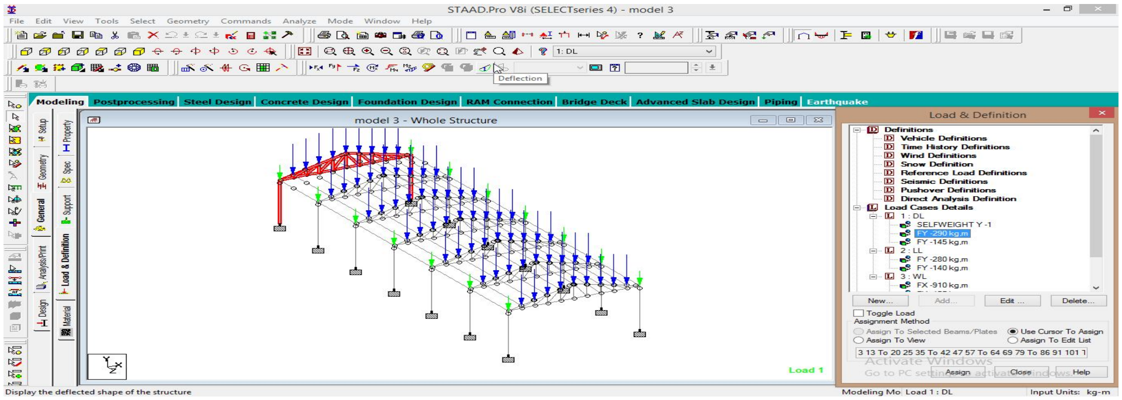


Fig No. 3 shows loading details of model no. 3

B. Properties

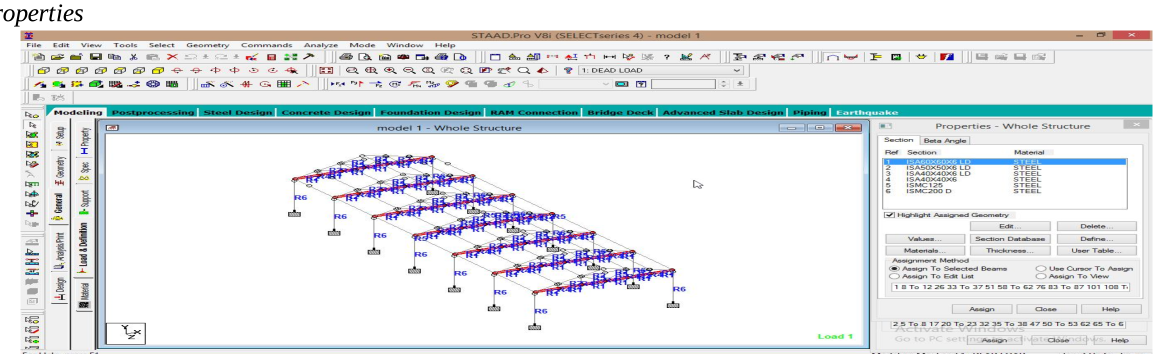


Fig No. 4 shows support reactions of model no. 1

C. Support Reactions

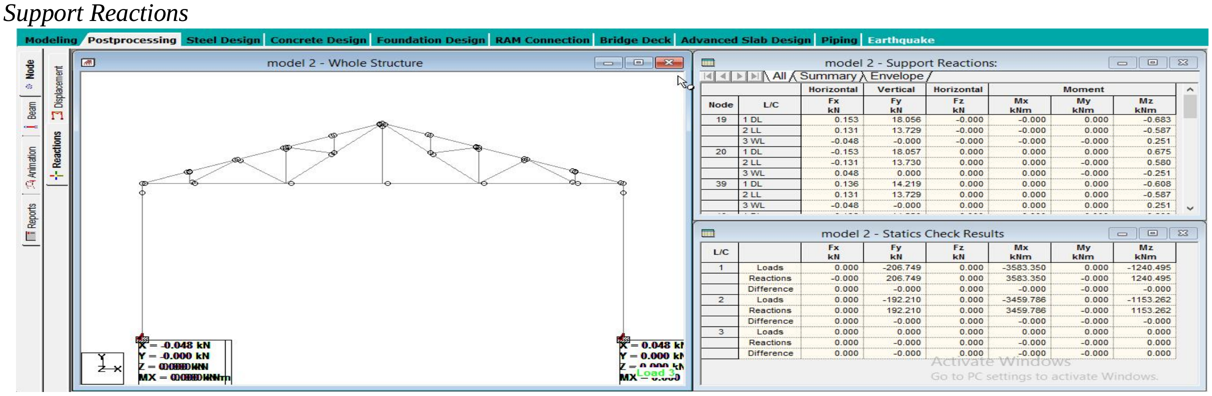


Fig No. 5 shows support reactions of model no. 2

D. Beam Stresses

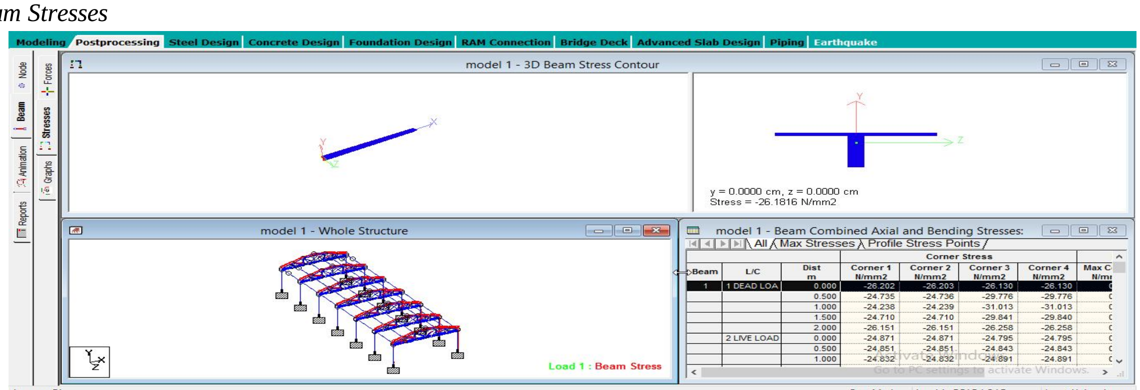
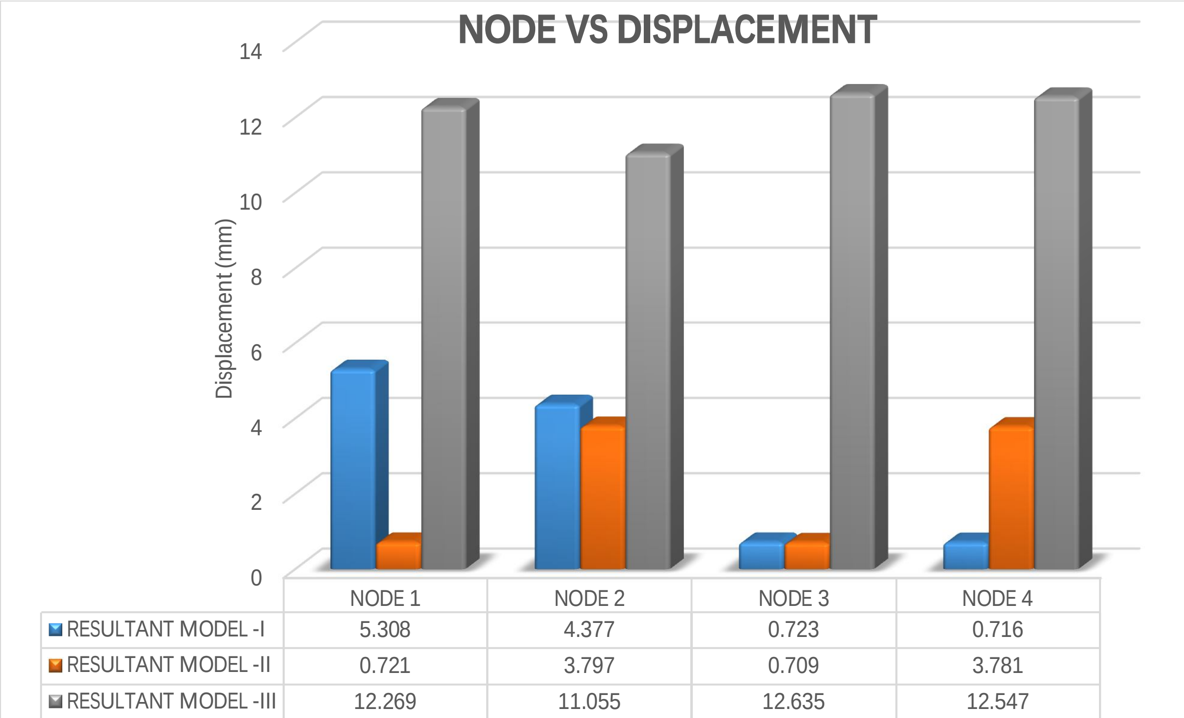


Figure No. 6 shows beam stresses of model no. 1

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com

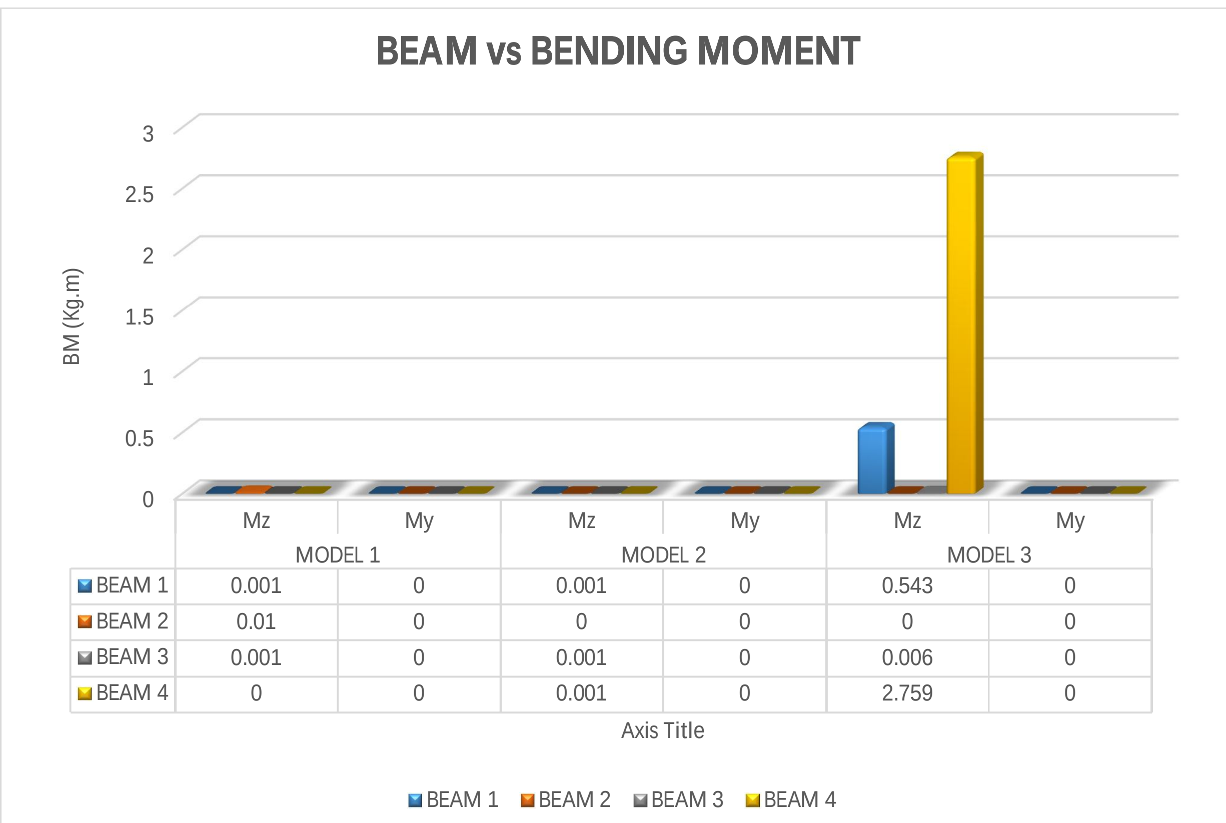
VI. RESULTS

In the present paper, comparison of analytical results of the selected models is done. For better understanding, the most critical nodes are selected to be compared. Comparison of different strength parameters such as axial force, shear force, bending moment, deflection of the selected nodes is done. At the end of paper the best truss configuration can be established.



	NODE 1	NODE 2	NODE 3	NODE 4
RESULTANT MODEL -I	5.308	4.377	0.723	0.716
RESULTANT MODEL -II	0.721	3.797	0.709	3.781
RESULTANT MODEL -III	12.269	11.055	12.635	12.547

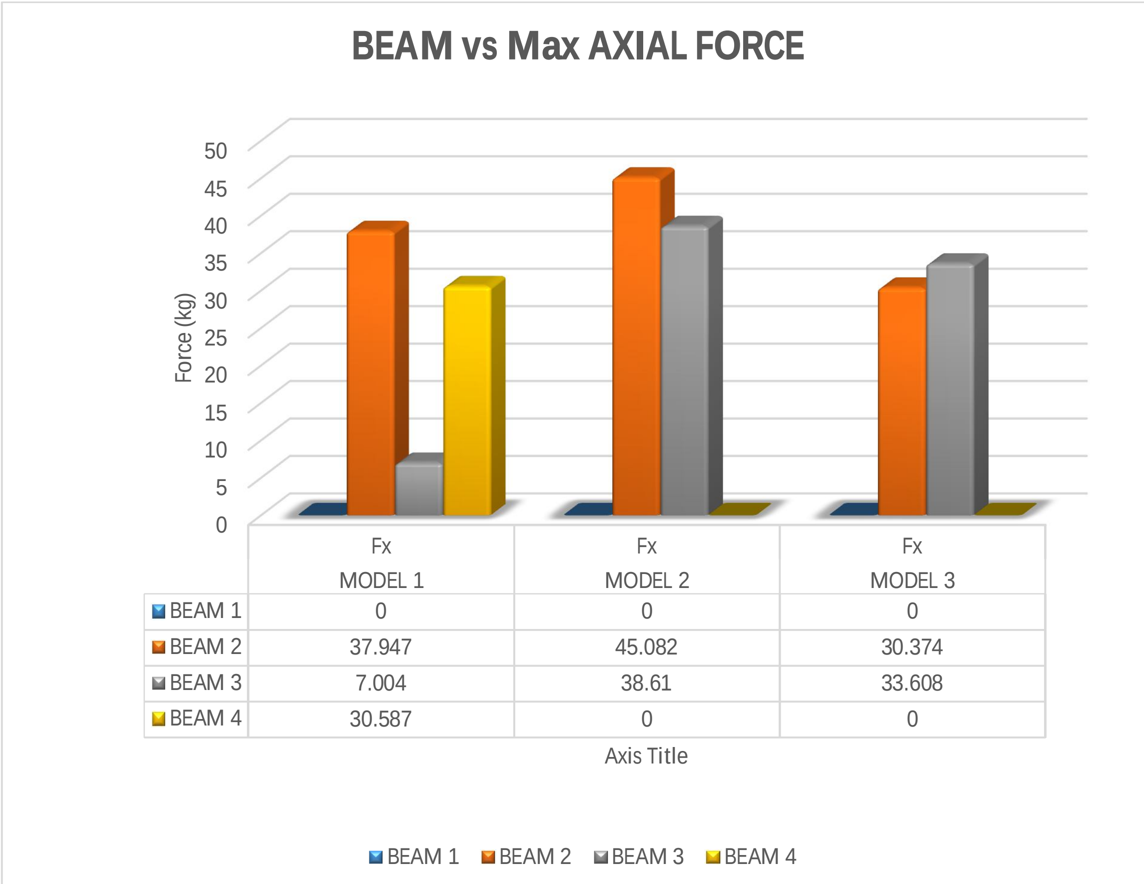
Graph 1 represents variations of displacement for the selected nodes of different models.



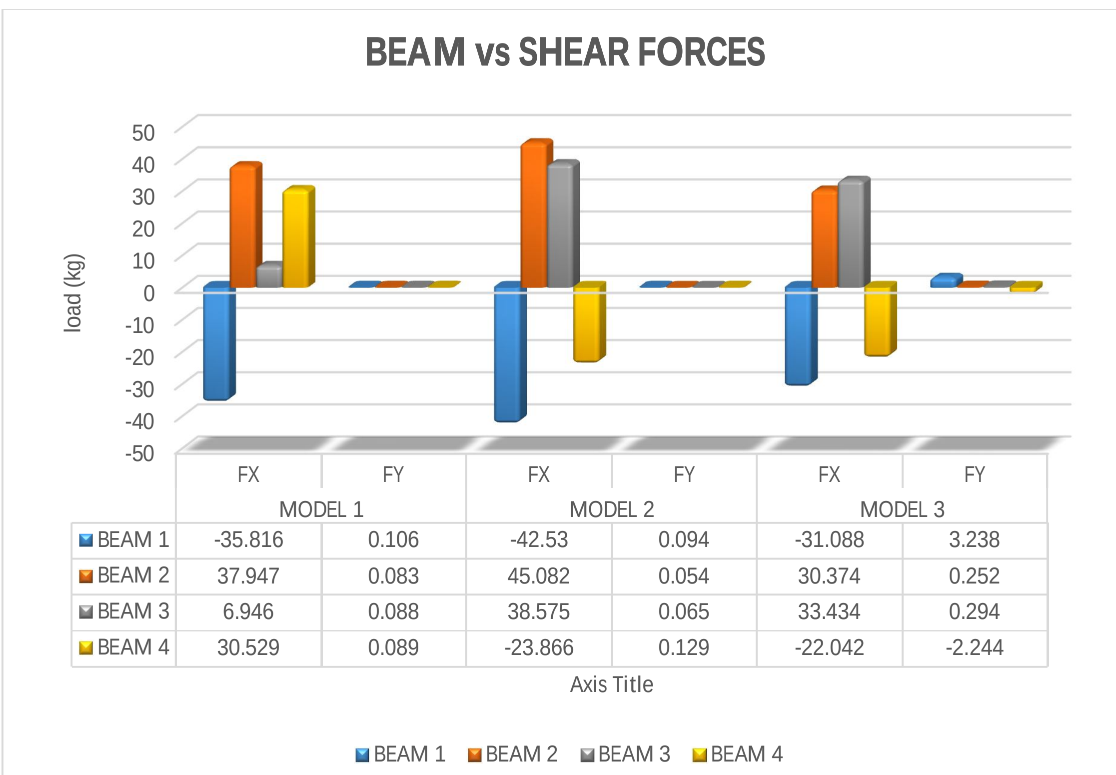
	MODEL 1		MODEL 2		MODEL 3	
	Mz	My	Mz	My	Mz	My
BEAM 1	0.001	0	0.001	0	0.543	0
BEAM 2	0.01	0	0	0	0	0
BEAM 3	0.001	0	0.001	0	0.006	0
BEAM 4	0	0	0.001	0	2.759	0

Graph 2 establish relation between bending moments and selected beams of different models.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com



Graph 3 establish relation between axial force and selected beams of different models.



Graph 4 establish relation between shear force and selected beams of different models.

VII. CONCLUSION

A. From the graph of load vs displacement it can be concluded that model no. 1 and model no. 2 shows lesser displacement.
B. Model no. 1 and model no. 2showed insignificant bending moment values.
C. From the above shown graph of shear force against loading, it can be seen that model no. 1 is having lesser shear force values on the selected nodes.
D. Similarly from the graph of axial force against loading it can be seen that all the models are having nearly similar axial force values.
E. Finally, it can be concluded that model no. 1 and model no. 2 are more efficient to be used as a roof truss for the selected plan dimensions.

VIII. ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and we are extremely privileged to have got this all along the completion of our project. All that we have done is only due to such supervision and we would not forget to thank them.

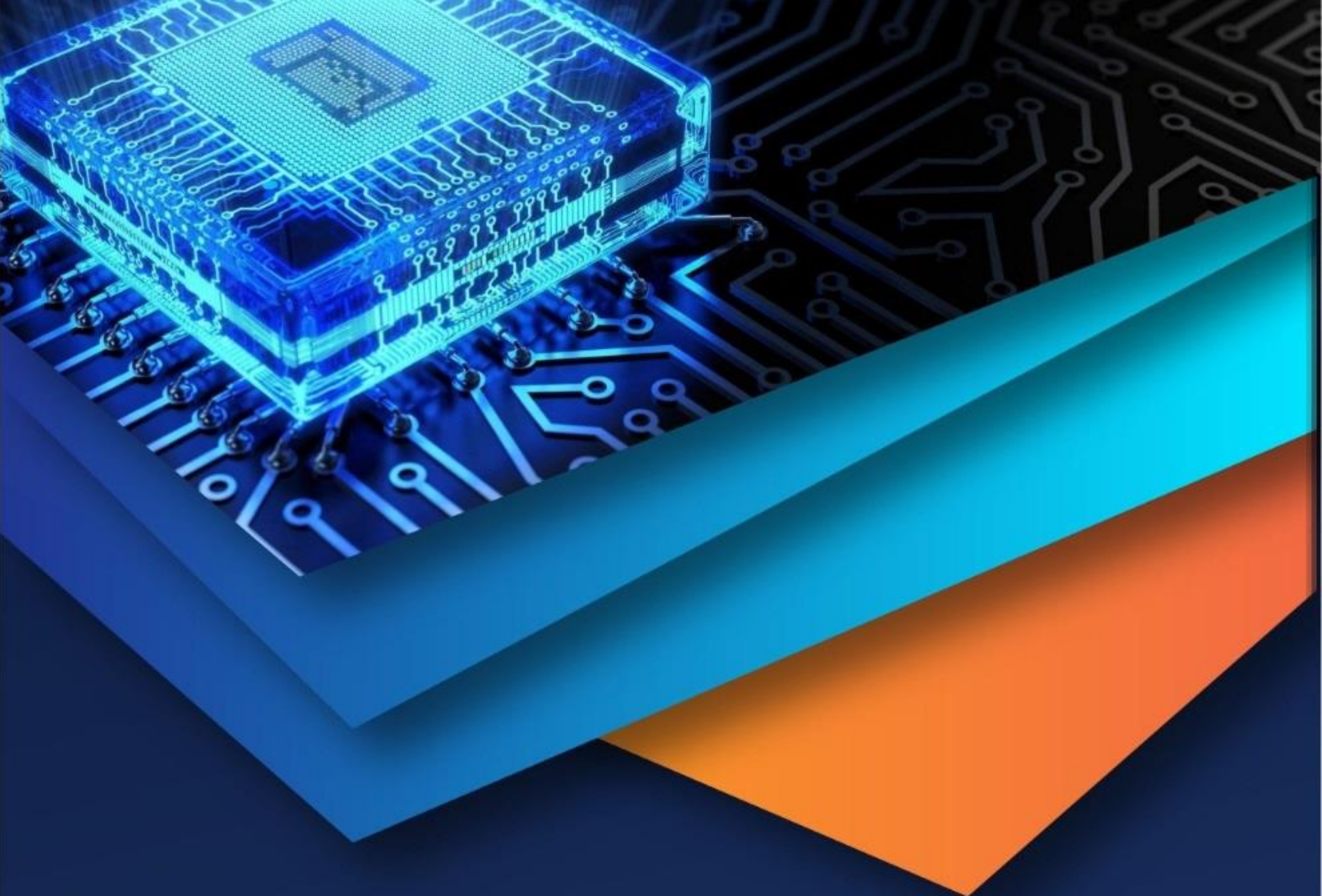
We owe our deep gratitude to our project guide Prof. Mohd. Azaz, who took keen interest on our project work and guided us all along, till the completion of our project work by providing all the necessary information for developing a good system.

We would not forget to remember our HOD of Civil Dept. Prof Amir Hussain for his encouragement and more over for the timely support and guidance till the completion of our project work.

We are thankful and fortunate enough to get constant encouragement, support and guidance from all Teaching staff of department which helped us in successfully completing our project work. Also, we would like to extend our sincere esteems to all staff in laboratory for their timely support.

REFERENCES

[1] SP 38: Handbook of Typified Designs for structures with Steel Roof Trusses (with and without cranes)(Based on IS Codes)
[2] IS 875 (Part 2) 1987: Code of practice for Design Loads (other than earthquake) for buildings and structures. Part 2 Imposed Loads (Second revision
[3] Design of steel structures by L.S. Negi.
[4] Design of steel structures by Dr .B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain
[5] Limit State Design of steel structures by Duggal.



10.22214/IJRASET

INDEX COPERNICUS 45.98

ISRA JIF IMPACT FACTOR: 7.129

SJIFactor IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY