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Dynamic Analysis of the Sloping Bridge Using Fem

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Abstract:

Throughout the work rumored exaggerated levels of vibration sloping Bridge Np.2 in terms of sloping Bridge No.1. Because of the exceptional importance of hair within the bridge supplay coal to the TE approach to the current drawback seriously and meted out preliminary measurements to see the vibration state of the development of the sloping bridge. In this paper modeling the sloping bridge is performed with the package package FEMAP and NX NASTRAN. FEMAP (Finite part Modeling And Post-processing) may be a package package used for the analysis of components and structures using the finite part methodology. it's vital to say that FEMAP has outlined units, or programs running on principle while not activity units. as a result of this, you wish to watch out once coming into all sizes, so as to get additional units of research results. within the gift case, as basic units can use: metric linear unit and N, that consequently leads to a unit N/mm2 (MPa) for strain. Based on the calculations performed antecedently conferred measurements were performed on a sloping bridge a pair of REK Bitola we have a tendency to awaken the subsequent conclusion: By calculation shows that the utmost displacement within the initial zone of frequencies is zero.0224mm. Also when measuring the vibration of the system in conditions once the instrumentality is operational, measured a most displacement of zero.056 metric linear unit at a frequency of seven cycle per second. the utmost acceleration of zero,556 m/sek2 registered at a frequency of 28 Hz, that is much from the frequencies of frequent tones forms the free oscillations of the system or the primary zone of thickening of frequencies starting from one.84Hz to 12.08Hz. therefore the system will acquire resonance condition in several forms treble, with no vital impact on the dynamic condition.

Key words: FEM , FEMAP, Frequencies, Sloping bridge, Vibration

INTRODUCTION

Finite component technique these days is already a separate scientific discipline beneath the scope of potential applications in several areas of engineering. above all the calculations and analysis of the leading structures of constructions finite component technique is associate exceptional application and substitutes all different ways. truly in reality sure bearing structure of mechanical style system with associate infinite range of degrees of freedom. The practical relevancy of FEM from the power to reduce the total system of sufficiently giant, but finite number of degrees of freedom. Finite component technique may be a sampling of the structure of components with the proper geometric form and therefore the thought of system all the way down to a finite range of degrees of freedom. The analysis of separate model consists of 2 basic parts:

1. initial component analysis (stick)

2. Second analysis system component (carriers) Analysis of a linear system includes the subsequent stages of calculation:
3. initial formation of the finite component model, i.e. separation of system nodes and sticks, every stick solely connects 2 nodes.
4. 2d selection of the unknown nodes. If we have a tendency to adopt the method of deformation formulation of the finite element technique, every node is adopted elements of displacement and tilt, as freelance parameters that characterize the stick and his behavior as an entire. The components of displacement in sure nodes of the stick is that the vector of generalized displacement rod u.
5. third choice interpolated functions. once elect in the unknown nodes, it's necessary to adopt the functions of the shift on that describes the state of voltages and deformations in every finite component. Through the perform of the form, the interpolated features a top quality image of the movements, they "interpolated" displacement of points on the axis between the values of the displacements at the ends of the stick. For interpolated functions ar adopted Hermit polynomials of the primary order.
6. fourth Establishing the essential equations of the ultimate element. the essential equations establish a relationship between the forces and displacements at the ends of the rod thought of as finite component.
7. fifth institution of a system of equations over the finite component model. These equations represent a system of algebraical equations for the unknown displacements of nodes. In forming the equations want to perform transformation of the unknown parameters of native and world reference system, which is accomplished by victimization the transformation matrix, whose kind depends on the geometric position of the local reference system relative to the worldwide coordinate system.

Material Properties

The dynamic material properties for the road-bridge as well as for the adjacent ground are vital information for the study of the road-bridge. Parameters concerning the soil characteristics are taken from the database that was formed during previous studies which were aimed of ensuring adequate vibration levels. By choosing the parameters according to that database it was easier to equate the results with research made previously. The database enclosing material data for the studies also contains information about suitable parameters for concrete and other materials such as asphalt.In Table 2.1 the material parameters which are used in the modelling are displayed. The quantities displayed in Table 2.1 are the materials density ρ [kg m3], Young's modulus E [MPa], Poisson's ratio v [−].

Table.1: Material Data

Material	Density (Kg/m^3)	Young's Modulus (MPa)	Poisson's Ratio
Asphalt	2600	5000	0.25
Concrete	2400	40000	0.20
Clay	2125	476	0.48
Bedrock	2600	8809	0.40

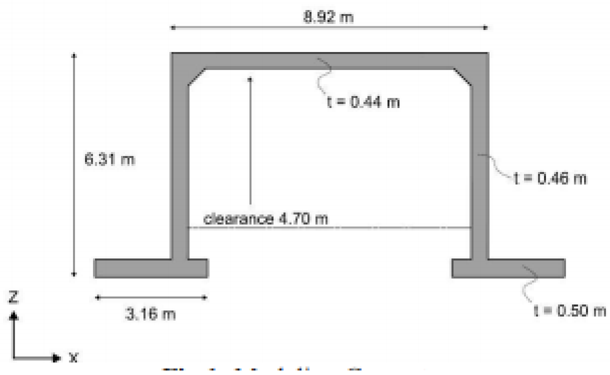

Fig.1: Modeling Geometry

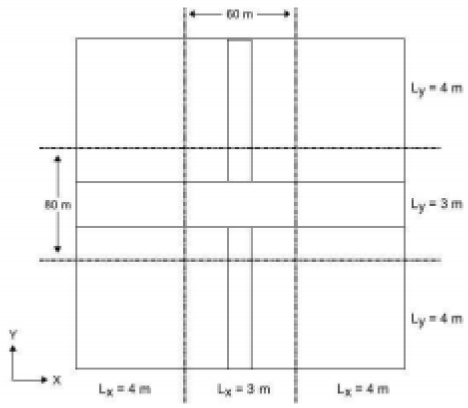

Fig 2: Element length Lx and Ly in the XY-Plan

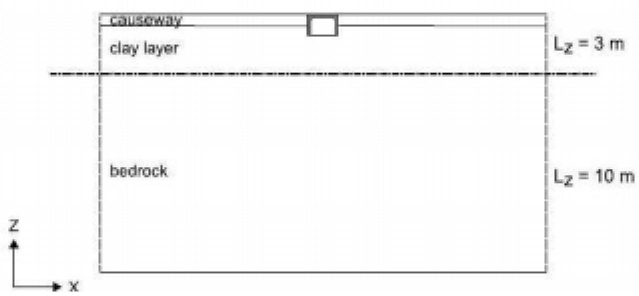

Fig 3: Vertical element length Lz

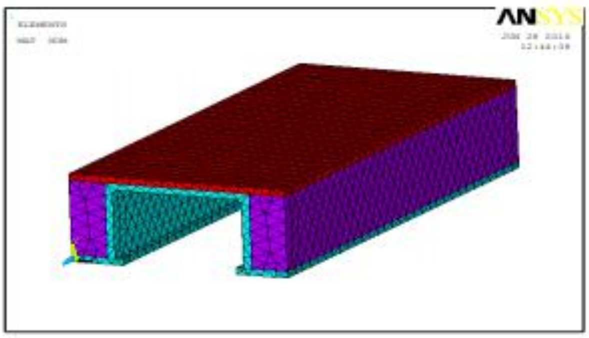

Fig 4: ANSYS model of bridg

The complete mesh for the whole model was dominated to the number and volume by the Solid185 element, which is a fully integrated isoparametric element in 3D of second order

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with 20 nodes. The outer boundaries are modeled with the Solid186 element which is an infinite element in 3D with 12 nodes and reduced integration. A problem that may arise when using infinite elements such as Solid186 is zero energy modes since the infinite boundaries does not provide any real boundary condition in terms of prescribed displacement. This is the explanation why the fully integrated element Solid185 had to be chosen instead of the version with reduced integration Solid183.

Modal Analysis of Bridge Structure

Table below is representing twelve natural frequencies of bridge. The readings are acquired from modal analysis with ANSYS.- First four frequencies are very small and after 12th natural frequency torsional mode obtained.

Table.2: Natural frequency of bridge obtained by analysis

S. No.	Natural Frequency
1	0.11223E-04
2	0.35764E-04
3	0.64400E-04
4	0.10850E-03
5	6.1893
6	9.4231
7	13.995
8	17.043
9	20.090
10	22.916
11	32.054
12	33.203

Results

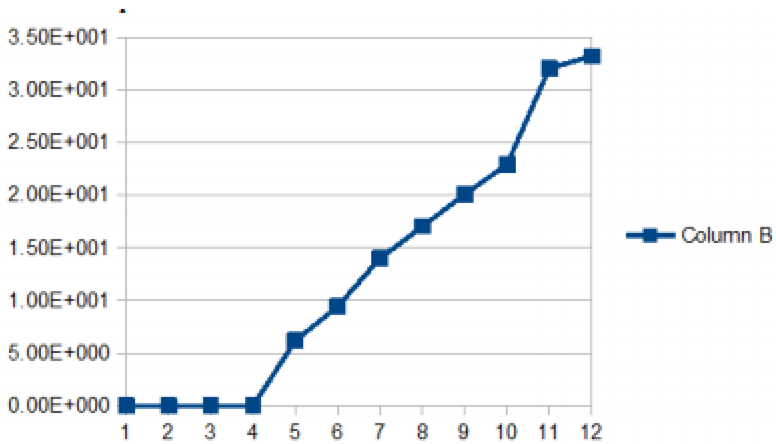

Fig 5: Graph representing natural frequency of bridge

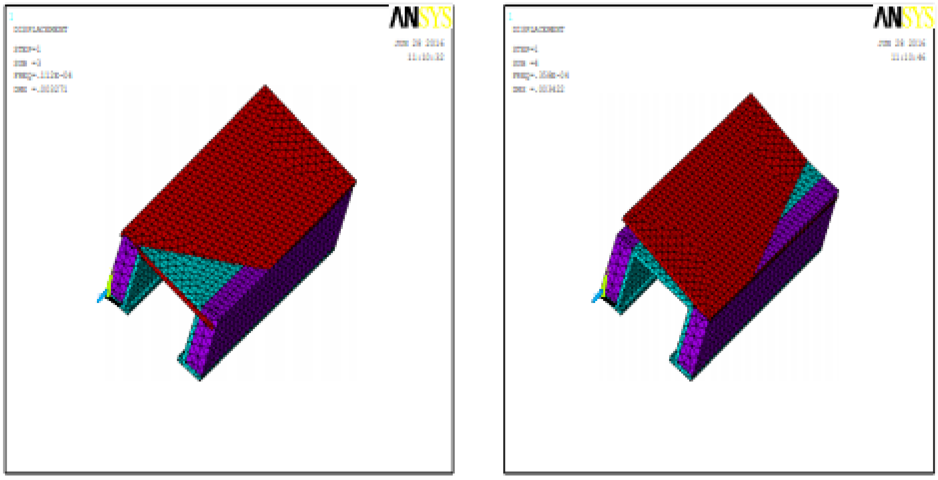

Fig 6: Mode shape I and II

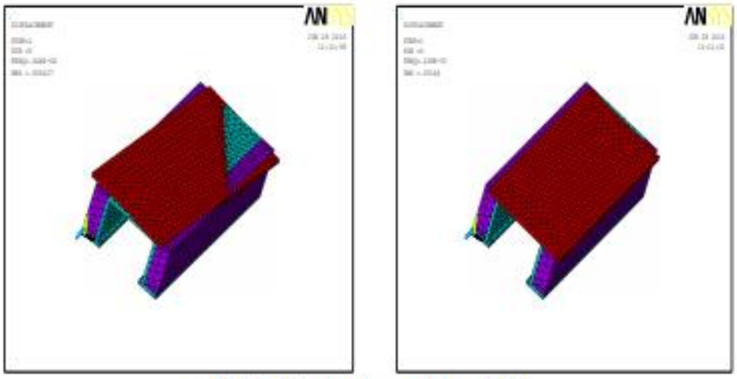

Fig 7: Mode shape III and IV

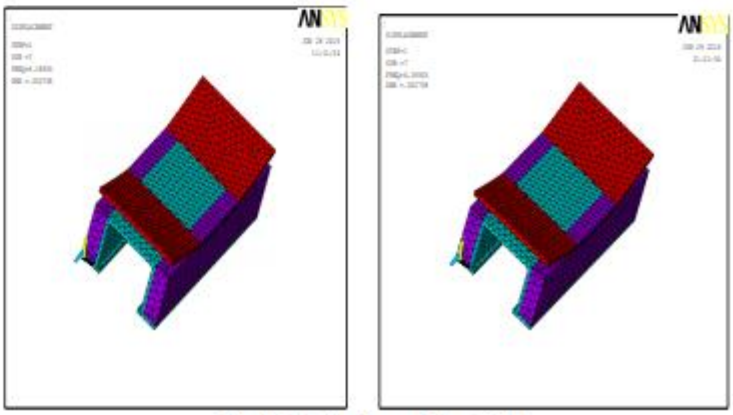

Fig 8: Mode shape V and VI

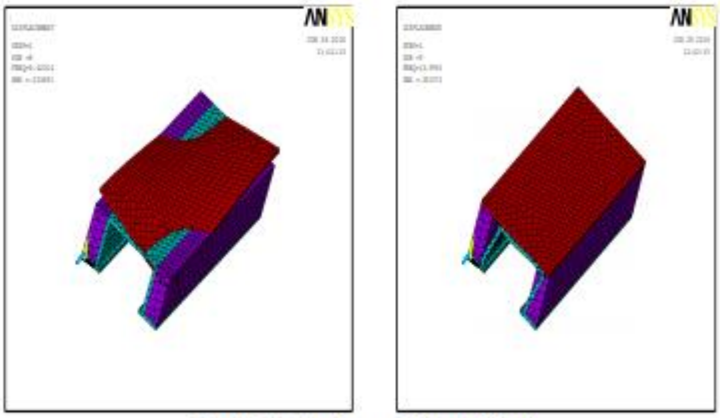

Fig 9: Mode shape VII and VIII

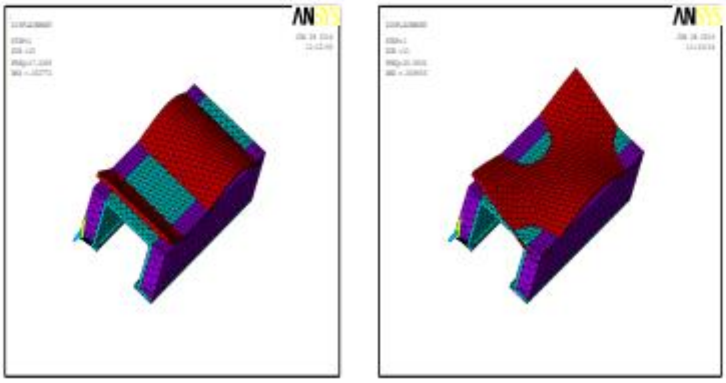

Fig.10: Mode shape IX and X

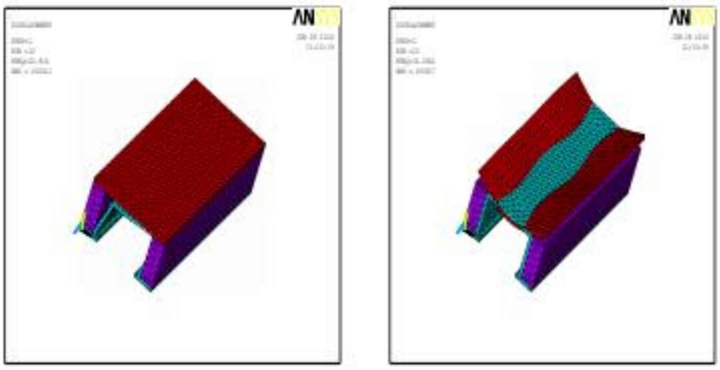

Fig11: Mode shape XI and XII

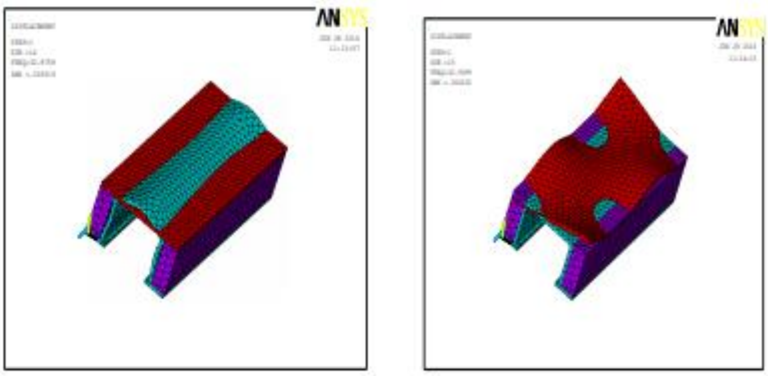

Fig 12: Mode shape XIII and XIV

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Fig 13: Mode shape XV

Conclusion and Future Scope

The advantage of the research approach in this paper is to save time, money and most importantly user life using simulation FEA software analysis. We can easily define various material properties with FEA software, and the modal analysis behaves Like actual bridge and the simulation results are quite close to exact solution. In present paper, the result is indicating various natural frequencies, it is concluded that that the bridge is not to be utilized at acquired frequencies which are equal to natural frequency at applied loads. If it is used at natural frequencies, resonances will occur and bridge may damage or fail. The future scope includes transient analysis and harmonic analysis of bridge, also the deflection of the bridge withtime can be obtained with FEA software approach.

References

[1]. Broquet, C., Bailey, S.F., Fafard, M. And Brühwiler, E., (2004), Dynamic Behaviour of Deck Slabs of Concrete Road Bridges, Journal of Bridge Engineering, Vol. 9, No. 2, ISSN 10084-0702/2004/2-137.

[2]. KAROUMI, R., (1998), Response of Cable-Stayed and Suspension Bridges to Moving Vehicles Analysis methods and practical modelling techniques,Doctoral Thesis, Royal Institute of Technology, Stockholm, ISSN 1103-4270.

[3]. Melaku.S, Hongsheng Qiu, Transient Dynamic Analysis of Simple Railway Bridge under Train Moving Load, 2014 International Conference on Civil Engineering, Energy and Environment

[4]. Bangash, M. Y. H., Concrete and Concrete Structures: Numerical Modeling and Applications, Elsevier Science Publishers Ltd., London, England, 1989.