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REVIEW STATIC AND DYNAMIC ANALYSIS OF A LAMINATED COMPOSITE BEAM

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Abstract – *A composite material is characterized as a material framework which comprises of a blend or a mix of two or all the more unmistakably distinctive materials which are insoluble in each other and vary in structure or concoction creation. In this manner, a composite material is named as any material comprising of two or more stages. Numerous mixes of materials are termed as composite materials, for example, solid, mortar, fiber strengthened plastics, and fiber fortified metals and comparable fiber impregnated materials. Two-phase composite materials are masterminded into two general orders: particulate composites and fiber fortified composites. Particulate composites are those in which particles having distinctive shapes and sizes are scattered inside a grid in an unpredictable configuration. Case as mica chips fortified with glass, lead particles in copper mixes and silicon carbon particles in aluminum. Particulate composites are used for electrical applications, welding, machine parts and diverse purposes.*

Key Words: **composite material, fiber impregnated materials, solid, mortar.**

1. INTRODUCTION

Fiber fortified composite materials comprises of filaments of critical quality and firmness inserted in a framework with particular limits between them. Both strands and framework keep up their physical and substance characters, yet their mix plays out a capacity which is impossible by every constituent acting separately. Filaments of fiber strengthened plastics (FRP) might be short or persistent.

It seems clear that FRP having nonstop strands is to be sure more effective. Grouping of FRP composite materials into four general classes has been done in like manner to the grid utilized. They are polymer lattice composites, metal framework composites, clay network composites and carbon/carbon composites. Polymer framework composites are made of thermoplastic or thermoset gums fortified with strands, for example, glass, carbon or boron. A metal grid composite comprises of a framework of metals or compounds strengthened with metal strands, for example, boron or carbon. Fired framework composites comprise of fired lattices fortified with fired strands, for example, silicon carbide, alumina or silicon nitride. They are for the most part powerful for high temperature applications.

2. LITRATURE REVIEW

Systematic Review of Literature concerned to static and dynamic analysis of laminated composite beam has been presented in this chapter. A nomenclature used by various author in their original work has been retained in this chapter as such. The concise nomenclature used in the foredooming chapter of present work is listed separately at the beginning of the thesis.

Dipak Kr.Maiti & P.K.Sinha [1] presented the bowing and free vibration examination of shear deformable covered composite shafts by limited component technique. The impacts of different parameters, for example, fiber introduction, stacking succession, range to-thickness proportion and bolster condition on the non dimensionalized redirections, burdens and major frequencies are explored. In the present examination a higher-request shear distortion hypothesis and the customary first-arrange hypothesis are utilized to build up a limited component technique to break down precisely the twisting and vibration conduct of overlaid composite pillars, utilizing ninenoded isoparametric components. The higher-request hypothesis accept all the dislodging parts, u, v and w, which contain variety up to a cubic force of z.

Satish kumar Mishra[2] Finite Element Analysis of laminated composite beam presented here, The effect of fiber orientation, number of plies, and stiffness ratio on the displacement of symmetric and anti-symmetric laminated composite plates subjected to uniform pressure loads are studied here. In thiswork, the dynamic behavior of beams and plate manufactured from fiber reinforced composite materials are considered. Modal analysis is carried out to determine the influence of fiber orientation as well as the stacking sequence on the natural frequencies in case of uniform loading over the plate.

Mohammed F. Aly et al.[3] In this paper, a joined limited component and test methodology is utilized to describe the vibration conduct of composite shafts. To this end, a few shafts are made utilizing the hand-lay-up procedure. Glass

fiber is utilized as fortification as a part of the type of bidirectional fabric and universally useful polyester sap as grid for the composite material of shafts. Test dynamic tests are completed utilizing examples with various fiber introductions. From the outcomes, the impact of fiber introductions on the flexural normal frequencies is explored.

Amer M. Ibrahim et al.[4] In this paper, a nonlinear limited component examinations have been completed to research the conduct up to disappointment of basically bolstered composite steel solid pillars with outer prestressing, , in which a strong piece is related together with steel I-shaft by strategy for headed stud shear connectors, subjected to symmetrically static stacking. ANSYS PC program has been used to analyze the three dimensional model. This spreads load redirection conduct, strain in bond, and strain in steel column and disillusionment modes.The nonlinear material and geometrical investigation in view of Incremental Iterative burden strategy, is embraced. Three models have been broke down to check its capacity and productivity. The outcomes got by limited component arrangements have indicated great concurrence with test results.

Hasan callioglu et al. [5] In this study the impacts of delamination length and introduction edges on regular recurrence of symmetric composite bars are examined logically and numerically. The scientific strategy is created utilizing the Timoshenko shaft hypothesis. The transverse shear impacts and rotating inactivity terms are taken into records in the administering condition of vibration. Two dimensional limited component models of the delaminated shafts are built up utilizing contact components at ANSYS.

Z.R. Lu et al. [6] Vibration Analysis of Beams with and without Cracks Using the Composite Element Model presented. A new method is presented to analyze the free and forced vibrations of beams with either a single step change or multiple step changes using the composite element method. The correctness and accuracy of the proposed method are verified by some examples.

Mehmet Colakoglu[7] Damping and vibration properties of polyethylene fiber composite are investigated under varied temperature. A damping observing technique is utilized to tentatively gauge recurrence reaction and the recurrence is acquired numerically utilizing a limited component program. The common frequencies of a framework are a component of its versatile properties, measurements, and mass. This idea is utilized to compute hypothetical vibration methods of composites. The damping properties, regarding the damping component, are dictated by the half-control data transfer capacity system. The time responses measured experimentally are compared with the numerically obtained ones. Good agreement between the two methods shows that numerical analysis can be used to determine the time response curve of polyethylene fiber composite.

Nguyen Viet Hung et al.[8] Finite Element Analysis for Various Structures Made of Classic and Composite Material by Using ANSYS Software created here In this paper, a few results acquired in exploration in numerical reenactment with ANSYS programming a profound framing procedure of a twofold sink, a stadium rooftop under the wind impact, and a Ferro-solid shaft fortified via Carbon Fiber Reinforced Polymer (CFRP) strips. The reenactments were done with help of different modules of ANSYS programming. Those are ANSYS multiphysics, ANSYS-CFX and ANSYS-LS Dyna.

Samir Assaf[9] In this study, a limited component model for the vibration investigation of cross-utilize covered sandwich bars is displayed. This detailing is an augmentation of work on foreseeing the acoustic and vibration reactions of sandwich pillars and plates with homogeneous flexible appearances and a viscoelastic center.

The detailing depends on a layer astute direct pivotal removal through the pillar thickness. The definition expect the established overlay hypothesis for the countenances and Timoshenko hypothesis for the center. The administering conditions of movement are gotten utilizing Hamilton's rule. A limited component technique and a bar component are further created to anticipate the regular frequencies and modular misfortune variables. So as to approve the proposed model, a few free vibration examinations of composite sandwich shafts with various limit conditions, length to thickness proportions and face covers are displayed.

Murat Kisa[10] This study is an examination of the impacts of splits on the dynamical attributes of a cantilever composite bar, made of graphite fiber fortified polyamide. The limited component and the part mode amalgamation techniques are utilized to demonstrate the issue. The cantilever composite pillar partitioned into a few segments from the split areas. Solidness diminishes because of splits are gotten from the crack mechanics hypothesis as the reverse of the consistence lattice computed with the best possible anxiety force variables and strain vitality discharge rate expressions. The impacts of the area and profundity of the splits, and the volume portion and introduction of the fiber on the characteristic frequencies and mode states of the pillar with transverse non proliferating open breaks, are investigated.

P.Subramanian[11] Free vibration examination of overlaid composite shafts is done utilizing two higher request uprooting based shear misshapening speculations and limited components taking into account the hypotheses. The distinction between the two hypotheses is that the primary hypothesis expect a non-explanatory variety of transverse shear stress over the thickness of the shafts though the second hypothesis accept an illustrative variety. The conditions of movement are determined utilizing Hamilton's standard. Further two-hub C1 limited components of eight degrees of opportunity for every hub, in light of the

hypotheses, are displayed for the free vibration examination of the bars in this paper. The examination study demonstrates that the hypotheses and the limited components foresee the normal frequencies of the overlaid composite bars superior to alternate speculations and the limited components considered.

Li Jun, et al[12] An element limited component strategy with the expectation of complimentary vibration investigation of by and large overlaid composite pillars is presented on the premise of first request shear disfigurement hypothesis. The impacts of Poisson impact, couplings among extensional, bowing and torsional distortions, shear misshapening and rotating dormancy are consolidated in the plan. The dynamic firmness lattice is detailed in view of the accurate arrangements of the differential conditions of movement administering the free vibration of for the most part covered composite pillar. The impacts of Poisson impact, material anisotropy, thin proportion, shear disfigurement and limit condition on the characteristic frequencies of the composite shafts are concentrated on in point of interest by specific precisely chose illustrations.

Faruk Fırat Calım[13] This study is planned to examine free and constrained vibrations of non-uniform composite bars in the Laplace area. The free vibration is then considered as an uncommon instance of constrained vibration. The Timoshenko pillar hypothesis is embraced in the inference of the administering condition. The material of the pole is thought to be homogeneous, direct versatile and anisotropic. The impacts of shear misshapening, rotational inactivity, non-consistency of the cross-area are considered in the plan. Standard differential conditions in scalar structure got in the Laplace space are illuminated numerically utilizing the correlative capacities strategy to compute the dynamic firmness framework of the issue precisely. The impacts of non-consistency parameters and edge of fiber introduction on element conduct are researched.

Mehmet Cevik [14] The in-plane free vibration investigation of symmetric edge utilize covered composite curves is done by limited components technique. The rotational idleness and shear disfigurement impacts have been incorporated into the investigation. Curves with opening edge (a) from 30° to 270° are mulled over. Parametric studies are performed to think about the impacts of fiber introduction point, limit conditions, material orthotropicity, sweep to-width proportion and number of layers on regular frequencies. The legitimacy of the limited component model is appeared by contrasting the outcomes and those accessible in the writing. Mode shapes are exhibited for two unique cases. It is found that central inplane regular recurrence of overlaid composite curves can be generously expanded by 30 to 60%, by utilizing edge employ rather than cross-handle. This percent expansion offers a significant favorable position that, for curve shafts, point employ cover can be desirable over cross-utilize overlay.

Thuc P. Vo, et al.[15] Static conduct of composite bars with discretionary layups utilizing different refined shear twisting hypotheses is exhibited. The created speculations, which don't require shear rectification element, represent parabolical variety of shear strains and thus shear stresses through the profundity of the shaft. Moreover, they have solid comparability with Euler–Bernoulli shaft hypothesis in a few angles, for example, overseeing conditions, limit conditions, and push resultant expressions. A two-noded C1 limited component with six degreeof-flexibility per hub which represents shear misshapening impacts and all coupling originating from the material anisotropy is produced to take care of the issue. Numerical results are performed for symmetric and hostile to symmetric cross-utilize composite bars under the consistently dispersed load and focused burden. The impacts of fiber point and lay-ups on the shear twisting parameter and augmentation bowing shear-torsion reaction are explored.

2. CONCLUSION

- Static analysis of laminated composite beams found that the transverse deflections of the clamped free laminated composite beam have higher value than the hinged-hinged and clamped-clamped beam respectively for all composite material we studied.
- Harmonic analysis of laminated composite beams found that undamped frequency (harmonic analysis) is minimum for clamped–free supported beam and maximum for clamped-clamped supported beam .In between these two, undamped frequencies of hinged-hinged supported beam lies for all composite material we studied.
- As the fibre angle of the unidirectional lamina of composite beam increases the transverse deflection also increases proportionally.
- As the thickness of the laminated composite beam is increases then the transverse deflections are decreases or when the thickness ratio (l/h) de
- creases then the transverse deflections are also decreases.
- The changes in fiber angle yield to different dynamic behavior of the component, that is, different natural frequencies and deflection for the same geometry, mass and boundary conditions.

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