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Report on

DESIGN & OPTIMIZATION OF THE TENSILE SPECIMENS USING DIFFERENT CELL STRUCTURES

A Project report submitted for the partial fulfilment of the requirements for award of Degree of

BACHELOR OF TECHNOLOGY

IN

MECHANICAL ENGINEERING

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CERTIFICATE

This is to certify that the project entitled **"DESIGN & OPTIMIZATION OF THE TENSILE SPECIEMENS USING DIFFERENT CELL STRUCTURES "** is the record of the work carried out by KANDELA SWARNA (19815A0386), RAVVA RAKESH RAVINDRA (19815A0369), PENTAKOTA ARUN KUMAR (19815A063), MUVVALA ANIL (19815A0352) students of final year B. Tech in the department of Mechanical engineering. This work is done for the partial fulfilment for the award of BACHELOR OF TECHNOLOGY during the year 2021-2022.

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ABSTRACT

Cellular materials have received a lot of attention in recent years because of their outstanding properties, such as high strength-to-weight ratio, heat transfer, energy absorption, and capability of improving noise, vibration and harshness (NVH) behavior.

Due to economic and environmental requirements, lightweight design is increasingly used in automobile and construction equipment applications. However, the conventional structures this behavior is mainly decided by the mass, so silence often requires heavy systems, leading to more energyconsumption and emission. Therefore, the environmental trends and the resulting economic competition have limited traditional (heavy) solutions to improve this behavior and make the lightweight design more difficult. Novel solutions are necessary to light the difficulty and challenge of manufacturing lightweight requirements.

In this research, design optimization was implemented on an automobile component i.e., car bumper to balance lightweight and applied load. The design optimized 3D model was filled by a non- homogenous cellular structure with optimal cell density via size optimization. Cell structure optimization is one type of design optimization, and it is the term for describing these procedures.

The new models were analyzed using the finite element method (FEM), and the results of the analysis were compared with the original model. After the comparison, positive results were obtained, demonstrating that design and cell optimization can be applied in the design of automobile equipment components. According to the results, cell structure optimization can create a reliable lightweight design with good NVH behavior. Furthermore, cell structure's organization and layout have a significant impact on the overall performance.