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复合材料层合回转壳瞬态温度场和热应力场分析

陈浩然, 息志臣, 李宏伟, 成万植, 孙延波

1. 大连理工大学; 2. 沈阳飞机制造公司

ANALYSIS OF TRANSIENT TEMPERATURE AND THERMAL STRESS FIELD IN LAMINATED COMPOSITE SHELLS OF REVOLUTION

Chen Haoran, Xi Zhichen, Li Hongwei, Cheng Wanzhi, Sun Yanbo

1. Dalian University of Technology; 2. Aircraft Manufacture Company Cheng

摘要

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摘要 本文用有限元法研究了复合材料层合回转壳瞬态温度场和热应力场。考虑了各种温度边界条件。假定各铺层是横观各向同性的,但其铺设方向可以是任意的。对8节点等参元,提出了一种新的集中热容阵,有效地提高了瞬态温度场计算精度。根据本文提供的数值结果,讨论了层合壳的热传导规律,并通过比较瞬态热应力与稳态热应力的分布和大小,阐述了瞬态效应。

关键词: 复合材料层合回转壳 瞬态温度场 热应力

Abstract: Transient temperature and thermal stress fields in laminated composite shells of revolution are studied by using finite element method. A variety of temperature boundary conditions are taken into account. Each ply is assumed to be transversely isotropic, but its ply angle may be arbitrary. To improve the accuracy of the transient temperature field, a new method of heat capacity matrix lumping is developed for a eight-node isoparametric element. According to the numerical results presented, the law of heat conduction is discussed. The transient behavior is assessed by comparing with the distribution and magnitude of transient thermal stresses with those of steady thermal stresses.

Keywords: laminated composite shell of revolution transient temperature field thermal stress

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