헬리콥터 고급이론 과제물 5번

제출기한: 6월 15일 (금)

1.

Problem #1: The purpose of this problem is to provide you with an opportunity to identify the differences between the "classical" flap-pitch flutter analysis of an isolated rotor blade in hover and the more accurate formulation that can be extracted from the nonlinear formulation that has been presented recently in the notes. The objective of the problem is to identify the differences between Eqs (20) and (21) pg 126 of the notes and the more accurate nonlinear derivation. To achieve this objective you need to take the following steps:

- Substitute the appropriate relations into the flap and torsion equations, Eqs. (108) and (110) pg 181 of the notes and set the lag degree of freedom $\zeta = 0$.
- These equations will be nonlinear and you can assume that the elastic restoring moments are : $M_\beta = K_\beta \beta$; $M_\phi = K_\phi \phi$ for flap and torsion respectively, where the K's are the appropriate spring constants.
- Compare these equations with Eqs. (20) and (21) pg 126 of the notes.
- Derive the equations from which the steady state equilibrium position in hover can be calculated and find β_0 *and* ϕ_0 if the solution to these algebraic equations is easy. If not, just explain how you would obtain the solution.
- Linearize the coupled flap-torsion equations about the static equilibrium position in hover and compare the linearized equations with equations (20) and (21) pg 126 of the notes.