Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH. (AERONAUTICAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2017

SUBJECT: AEROELASTICITY [AAE 4005]

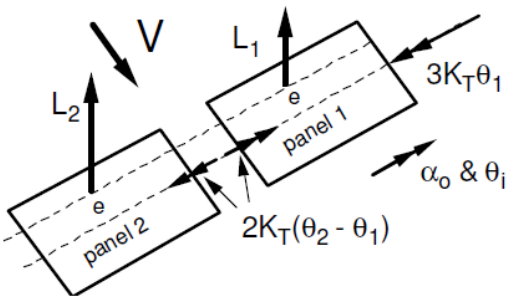
REVISED CREDIT SYSTEM
(02/01/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

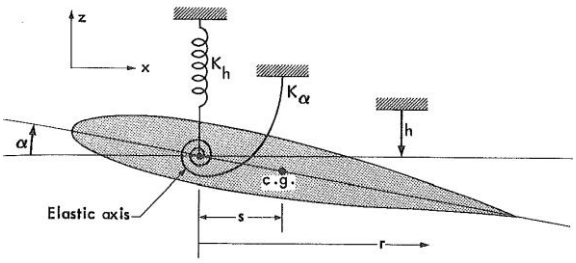
1A. Consider a two degree- of-freedom model shown in figure 1, with semi-span, b, and wing chord, c, to develop the static stability solution. This model consists of two wing sections mounted on a rigid shaft that excludes wing plunge but permits torsional rotation. Calculate the divergence dynamic pressure. **(07)**



(Figure 1)

1B. Calculate the natural mode shapes of the uniform torsion member with a fixed and a free end. **(03)**

2A. Using the Lagrange's equation for two DOF primitive dynamic aeroelastic model representing subsonic case as shown in figure 2. How will you estimate the conditions for flutter to occur? **(07)**



(Figure 2)

2B. Describe the method to find the vibration (both free and bending) of a beam using differential Eigen value problem. **(03)**

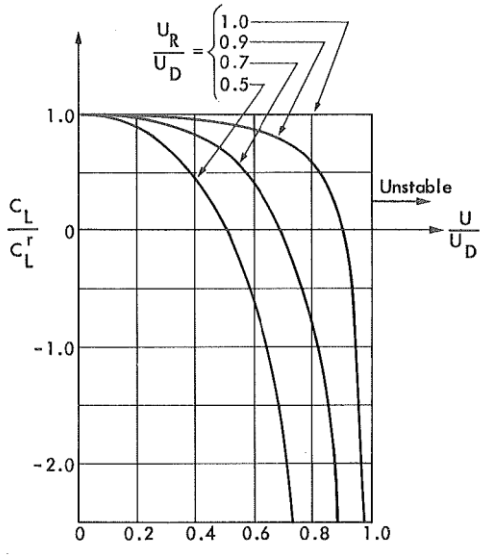
3A. Explain Galerkin's method and why it is used as one of the approximate methods for assumed shape error calculation? **(05)**

3B. Explain the use of Maxwell and Betti reciprocal theorem in analyzing the structural modeling (deformation). **(05)**

4A. Explain how do you find the approximate solution to the deformation of structures using Rayleigh-Ritz approach. **(05)**

4B. What is control surface reversal? Use analytical method to show that aileron reversal speed is independent of offset between aerodynamic center and elastic axis. **(05)**

5A. Explain the variation of aileron effectiveness with speed as shown in figure 3 below. **(05)**



(Figure 3)

5B. Explain how the Lagrange's equation is obtained from the extended Hamilton principle. **(05)**