**Aeroelasticity M2795.005900**

**Mid-Term Examination**

Date: October 29 (Wednesday) 15:30 – 16:45

1. (20 Points) In the derivation of Theodorsen’s formulation about the unsteady lift and aerodynamic pitching moment, explain **where** and **why** the lift deficiency factor, *C*(*k*), expressed below, appears in the formulation.



1. (10 Points each) Briefly describe the following five analytical functions for the unsteady aerodynamics on an either fixed or rotary wing, **without** any mathematical equations or their derivations.
   1. Theodorsen’s function
   2. Sears’ function
   3. Wagner’s function
   4. Küssner’s function
   5. Loewy’s function

(Please add appropriate plots or figures for each function if they are necessary.)

1. (15 Points each) Determine the first natural bending frequency of the cantilevered beam (Fig. 1) using both Galerkin and Rayleigh-Ritz methods (15 Points each). In both methods, use the following assumed mode shape.







Figure 1. Cantilevered beam