

Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 7 – EXAMINATION – SUMMER 2026

Subject Code: 3170110

Date: 29/05/2026

Subject Name: Introduction to Aeroelasticity

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

Q.1 (a) Define Aeroelasticity and explain the Collar's Triangle. 03

(b) Explain the term 'Influence Coefficients' in structural deformation. 04

(c) What is meant by 'Aileron Reversal'? Explain in details. 07

Q.2 (a) Define 'Divergence Speed'. 03

(b) Classify Aeroelastic problems using a flow chart. 04

(c) Derive the expression for the Divergence Speed of a 2-D airfoil section. 07

OR

Q.2 (c) Analyze the 2-D Flutter model (Bending-Torsion) and explain the coupling mechanism. 07

Q.3 (a) Briefly explain the 'One Dimensional Aeroelastic Model'. 03

(b) Describe the Energy Method used in solving aeroelastic problems. 04

(c) Discuss the exact treatment of Bending-Torsion Flutter of a Uniform Wing. 07

OR

Q.3

	(a) What is 'Flutter' in the context of a 2-D airfoil?	03
	(b) Explain Control Effectiveness and how it varies with flight speed.	04
	(c) Detailed comparison between U-g and P-k methods for flutter calculation.	07
Q.4	(a) Identify the difference between Subsonic and Supersonic flow in aeroelasticity.	03
	(b) Compare Swept Wing divergence with Straight Wing divergence.	04
	(c) Explain 3-D Supersonic flow considerations in Aeroelasticity.	07
	OR	
Q.4	(a) What is the 'Kernel Function Approach'?	03
	(b) Discuss the Theodorsen Theory for unsteady aerodynamics.	04
	(c) Discuss the impact of wing loading and structural deformations on Aeroelastic stability.	07
Q.5	(a) Define the 'U-g Method' for flutter calculation.	03
	(b) Explain the Finite State Model in unsteady aerodynamics.	04
	(c) Explain the 'Assumed Mode Method' for flutter analysis.	07
	OR	
Q.5	(a) Explain the 'P-k Method' briefly.	03
	(b) Discuss in detail the fundamental requirements for aeroelastic stability in a flexible aircraft structure.	04
	(c) Describe on aeroelasticity stability	07
