PRN:		Course Code :	P69PE101

First Year **M. Tech** Semester End Examination Winter 2024 000462

Advanced Aerodynamics

Day and Date: Fri 6 DEC 2024 Max Marks: **50**

Time : 10:30AM To 12:30PM Duration: **02** hrs

Instructions:
1. All questions are compulsory.
2. Assume suitable data wherever necessary and mention it clearly.

			Marks	Bloom's Level	CO
Q.1		**Attempt the following Question.**			
	a)	Define lift and drag. How do these aerodynamic forces affect the flight of an aircraft?	10	1	1
Q.2		**Attempt the following Question.**			
	a)	What is a doublet in fluid flow? How is it formed by combining a point source and a point sink?	10	2	1
		OR			
	b)	State and explain the Biot-Savart law. How is it applied to calculate the velocity induced by vortices in fluid flow?	10	3	2
Q.3		**Attempt the following Question.**			
	a)	Describe Rayleigh flow. What is the relationship between pressure, temperature, and Mach number in Rayleigh flow?	10	1	3
		OR			
	b)	Explain the behavior of compressible flow through a converging-diverging nozzle. How does the flow transition from subsonic to supersonic speeds?	10	2	3
Q.4		**Attempt the following Question.**			
	a)	What is viscous flow? How does it differ from inviscid flow? Explain in detail	10	1	4
		OR			
	b)	Define the boundary layer in fluid dynamics. What are the key characteristics of a boundary layer?	10	3	4
Q.5		**Attempt the following Question.**			
	a)	Define the drag divergence Mach number. How is it related to the onset of shock formation and drag increase in transonic and supersonic flight?	10	3	5
		OR			
	b)	Explain the concept of supercritical airfoils. How do they differ from conventional airfoils in terms of drag and aerodynamic performance at transonic speeds?	10	3	5

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