CBCS SCHEME

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BAE402/BAS402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Aerodynamics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Gas tables and θ, β, μ chart are permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Derive the equation to lifting flow around a circular cylinder.	10	L3	CO1
	b.	Derive the velocity potential function and stream function for doublet flow.	10	L3	CO1
		OR			
Q.2	a.	Explain about the various forces and moments acting in the airplane.	10	L2	CO1
	b.	Derive and explain about the classical thin airfoil theory and explain the application in camber airfoil.	10	L3	CO1
		Module – 2			
Q.3	a.	Derive and explain about the Prandtl's lifting line theory with the elliptic wing distribution.	10	L3	CO2
	b.	Explain about the types of drag acting on the airplane surface.	10	L2	CO2
		OR			
Q.4	a.	Derive and briefly, explain about the vortex lattice method for wings.	10	L2	CO2
	b.	Explain about lift, disc and moments characteristics of complete airplane.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the horseshoe vertex and draw the vortex model for simplified horse show vortex.	10	L2	CO3
	b.	Explain about the effect of swept wings and aerodynamic characteristics.	10	L2	CO3
		OR			
Q.6	a.	Explain about critical Mach number, drag divergence mach number, effect of thickness, camber and aspect ratio of wings.	10	L2	CO3
	b.	Explain about transonic area rule and subsonic, supersonic leading edges.	10	L2	CO3
		Module – 4			
Q.7	a.	Derive and explain about the Bernoulli's equation.	10	L3	CO4
	b.	Explain with the derivation how to convert the pressure in to lift and drag forces.	10	L2	CO4
		OR			
Q.8	a.	Explain about the critical mach number and the drag divergence mach number and the drag divergence mach number with graphical representation and effects in supersonic flows.	10	L2	CO4
	b.	Derive and explain about the flow through convergent divergent nozzles.	10	L3	CO4
		Module – 5			
Q.9	a.	Derive and explain with the graphical representation of Rankine Hugoniot equation.	10	L2	CO5
	b.	The airflow at mach number 4 and pressure $1 \times 10^5 N/m^2$ is turned abruptly by a wall into the flow with a turning angle of 20°. If the shock is reflected by another wall. Determine the flow properties of mach number, pressure at the downstream of the shock.	10	L3	CO5
		OR			
Q.10	a.	Derive the equation for Prandtl's relation for normal shock.	10	L3	CO5
	b.	A uniform supersonic stream with mach number 3 pressure 1 atm and temperature 288K encounters a compression corner, which deflect the stream as an angle of 20°. Calculate the fluid properties behind the shock wave.	10	L3	CO5

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