Model Question Paper-1 with effect from 2022-23 (CBCS Scheme)

USN | | | | | | | | | | |

Fourth Semester B.E. Degree Examination

Subject Title: Aerodynamics

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
02. Use of **Gas Tables** is permitted

		Module -1	*Bloom's Taxonomy Level	Marks
Q.01	a	Show that the stream function is depends on half of the source strength for the combination of Uniform, Source and Sink flows.	L4	10
	b	With a neat sketch and notations, Illustrate the Non-lifting flow over a circular cylinder.	L2	10
		OR		
Q.02	a	Derive an expression for Lifting Curve Slop for Cambers airfoil by using classical thin airfoil theory.	L4	10
	b	A source flow having 0.620 m²/s. the pressure at radius of flow is 5mm is 200 KN/ m². Find i)pressure at radius of 550mm ii) Plot stream line and potential line.	L3	6
	c	Write a short note on Kutta-Condition for Lifting over an airfoil.	L2	4
		Module-2		
Q. 03	a	Derive an expression for Prandtl's Classical lifting line theory.	L4	10
	b	Explain the effect of Downwash & Induced Drag.	L2	6
	c	Write a importance of Biot-Savart Theorem for Finite Wing.	L2	4
		OR		
Q.04	a	Consider finite wing with an Aspect Ratio of 10 & Tapered ratio 0.5 Airfoil section thin & Symmetrical. Calculate lift & Induced drag coefficient for wing when it has an angle of attack 10°. Assume $\delta=\tau$ and δ is 0.055.	L3	10
	b	Derive an equation for Elliptical & Modified lift distribution.	L3	10
		Module-3		
Q. 05	a	Illustrate the importance of Sweep wing and its effect in Configuration of an airfoil.	L2	10
	b	Summarize about Subsonic & Supersonic Leading Edge.	L2	5
	c	Describe Horshoe-Vortex Model with a suitable sketch.	L2	5
		OR		
Q. 06	a	Discuss about High Lift Devices.	L2	10
	b	Write a note on Transonic area rule.	L2	4
	c	Paraphrase the Source panel & Vortex lattice method.	L2	6
		Module-4		
Q. 07	a	Draw a neat sketch & explain variation of pressure along Convergent-Divergent duct for various back pressure.	L2	10
	b	The pressure, temperature & mach number at entry of a flow passage are 2.45 bar, 26.5°& 1.4 respectively. If extend mach number is 2.5, Calculate for adiabatic flow of a perfect gas having $\gamma=1.3$ & R=0.469 KJ/KgK.	L3	10
		OR		

Q. 08	a	Derive an expression of Adiabatic state energy equation.	L4	10
	b	A flow in a duct has a velocity 300 m/s , pressure 1 bar & temperature 290K. Taking γ=1.4 & R=287KJ /KgK. Determine i) Stagnation temperature ii) Velocity of Sound in dynamic & stagnation condition.	L3	10
Module-5				
Q. 09	a	Derive an equation for Mach number downstream of Normal Shock Wave.	L4	10
	b	Air approach symmetrical wedge δ=15° at mach number 2.0. Analyze the strong & weak wave for a)Wave angle b) Pressure ration c) Density d) Temperature ration e) Downstream Mach number.	L3	7
	c	With a neat sketch explain about Supersonic flow over a wedge of an airfoil.	L2	3
OR				
Q. 10	a	Starting from the general energy equation for flow through an Oblique shock wave, Obtain the Prandtl's equation.	L4	10
	b	Explain the following a)Shock polar b)Hodograph Plane c) Intersection of waves.	L2	10

*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.