B.E. (Aeronautical Engineering) Fifth Semester (C.B.S.)

## Aerodynamics - II

## P. Pages : 2 Time : Three Hours

## NIR/KW/18/3456

Max. Marks : 80

1.	Not	<ul> <li>es: 1. All questions carry marks as indicated.</li> <li>2. Solve Question 1 OR Questions No. 2.</li> <li>3. Solve Question 3 OR Questions No. 4.</li> <li>4. Solve Question 5 OR Questions No. 6.</li> <li>5. Solve Question 7 OR Questions No. 8.</li> <li>6. Solve Question 9 OR Questions No. 10.</li> <li>7. Solve Question 11 OR Questions No. 12.</li> <li>8. Assume suitable data whenever necessary.</li> <li>9. Illustrate your answers whenever necessary with the help of neat sketches.</li> <li>10. Use of non programmable calculator is permitted.</li> </ul>	6
	b)	Explain in brief with well labelled diagram the formation of wing tip vortex.	7
		OR	
2.		Explain in brief with well labelled diagram momentum theory of wing for lift.	13
3.	a)	For a straight vortex filament (from $+\infty$ to $-\infty$ ) calculate the induced velocity.	6
	b)	Consider a finite wing with an aspect ratio of 8 and a toper ratio of 0.8. The airfoil section is thin and symmetric. Calculate the lift and induced drag coefficient for the wing when it is at an angle of attack of 5° assume $\delta = \overline{C} \ \delta = 0.055$ and $a_0 = 2\pi$ .	7
		OR	
4.	a)	For a straight vortex filament (from 0 to $+\infty$ ) calculate the induced velocity.	6
	b)	Derive the fundamental equation of Prandtl lifting line theory.	7
5.	a)	Write a note on a winglet and strakes.	6
	b)	Explain in brief drag characteristics of a complete aircraft with neat sketches.	7
		OR	
6.	a)	Discuss flow past over slender bodies.	6
	b)	Explain in brief with well labelled diagram wing tip devices.	7
7.	a)	Calculate the lift and wave drag co-efficient for an infinitely thin flat plate in a mach 2.6 freestream at angle of attack of $\alpha = 15^{\circ}$ .	8
	b)	Explain in brief with well labelled diagram supersonic area role.	5

10 8. Derive the linearized supersonic pressure coefficient formula. i. e.  $Cp = \frac{2\theta}{\sqrt{M_{cs}^2 - 1}}$ a) At a given point on the surface of an airfoil the pressure coefficient is -0.3 at very low 3 b) speed. If the freestream Mach number is 0.6. Calculate the Cp at this point. 9. Explain in brief with well labelled diagram the working principal of low speed wind tunnel. 7 a) 7 b) Explain in brief with well labelled diagram solid blockage. OR 10. Discuss the parts and working procedure of hypersonic wind tunnel. 7 a) Explain in brief the classification of a subsonic wind tunnel. 7 b) 11. Explain in brief with well labelled diagram the construction and working of a schlieren 7 a) system. Explain in brief pressure plotting technique used in wind tunnel. 7 b) OR 7 12. a) Explain in brief the principle and method for the measurement of pressure velocity and Mach number. 7 b) Write a note on smoke and tuft flow visualization method.

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