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JAYA GROUP OF INSTITUTIONS-THIRUNINRAVUR

6th SEM – B.E. / B.Tech MODEL-II

INTERNAL ASSESSMENT-1(MODEL EXAM-1)

IA -II

Sub. Name: **AERODYNAMICS-I** Date: 06-03-2015
Sub. Code: AE 6401 Branch: Aeronautical
Duration: 180 minutes Max.Marks: 100

PART-A (10 x 2 =20)

1 What is the principle involved in the conformal transformation?
2 Define vortex filament.
3 State the Helmholtz theorem.
4 What are the application of thin aerofoil theory?
5 Define complex potential function.
6 What is the importance of Kutta condition?
7 Define wash-in and wash-out.
8 Consider a circular cylinder kept in a uniform flow of free stream velocity 100m/s. The velocity at a given point of cylinder is 200m/s. Calculate the pressure coefficient at this point.
9 What do you mean by singular point in conformal transformation?
10 What is D'Alembert paradox?

PART-B (5 x 16 =80)

11 a) Based on Kutta-Jowkowski's transformation, obtain the transformation of a circle into a cambered aerofoil. Also obtain an expression for the thickness to chord ratio.

Or

b) Obtain the expression for the complex potential function for a doublet at origin

12 a) Derive the fundamental equation of Prandtl's lifting line theory and obtain the expression for the induced drag coefficient for elliptical lift distribution

Or

b) (i) An aerofoil is kept at the uniform wind of velocity v density ρ and circulation ζ
Derive the expression for the lift produced using the Blasius theorem

13 a) Show that the transformation $\zeta=z+\frac{b2}{z}$ transform a circle into a symmetrical aerofoil profile

Or

b) Derive the fundamental equation of thin aerofoil theory. For flows over a flat plate show that the lift coefficient is proportional to angle of attack

a)

14 Consider an NACA 23012 airfoil. The mean camber line for the aerofoil is given by

$\frac{z}{c} = 2.6595\ [\ (\frac{x}{c})^3 - 0.6075\ (\frac{x}{c})^2 + 0.1147\ \frac{x}{c})]$ for $0 \le x/c \le .2025$

And $\frac{z}{c} = .02208\left(1-\frac{x}{c}\right)$ for $.2025 \le x/c \le 1.0$

i) Calculate the angle of attack at zero lift and the lift coefficient when $\alpha = 4^{\circ}$

Or

B)Calculate the moment coefficient at the quarter chord and the location of center of pressure in terms of xcp/c when $\alpha=4^{\circ}$

15 a) (i) Explain the term Vortex line starting vortex and horse shoe vortex
(ii) Briefly explain karmen –trefftz and von-mises airfoil with neat sketch

Or

b) State and prove Blasius theorem