

CODE NO: RR 221801

2006 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

II B.TECH IISEMESTER REGULAR EXAMINATIONS

**AERODYNAMICS-I
(AERONAUTICAL ENGINEERING)**

APRIL/MAY 2006

TIME:3 HOUR
MARK:80

ANSWER ANY FIVE QUESTIONS ALL QUESTIONS CARRY EQUAL MARKS

1. Write a detailed note on NACA 4 digit numbering system. As this system produces open trailing edge, how do you get the trailing edge?
2. Following data was obtained from wind tunnel test. The pitching moment coefficients were taken about a spindle located $1/3$ rd of chord behind the leading edge:
CL 0.2 0.4 0.6 0.8
Cm -0.02 0.00 0.02 0.04 Find the value of aerodynamic center and Cm_0 . Develop the expression used.
3. Define total drag acting on an airplane and its components. What are the causes of each of these components? Compare the total drag acting on a Jumbo jet and that on a supersonic fighter plane. Make use of sketches /plots to illustrate your answer.
4. Sketch the stream line pattern of the flow given by the Complex Potential function $w = A z^2$, where A is a constant and other symbols have usual meaning. Find the magnitude and direction of the stream at $x = 1, y = 2$ when $A = 10$.
5. Prove that the thickness ratio of a symmetrical Zhukovsky airfoil is approximately 1.3 times $(a/b - 1)$, where b is a constant of transformation and a is the radius of the circle of transformation.
6. Two propellers are required to be used in tandem for producing maximum efficiency. Making use of Froude Momentum theory work out the size and location of the rear airscrew.
7. A turbo-prop powered airplane is flying at 260 Knots at 6000 m altitude on a standard day. Each of the 4.26 m dia. ,4 bladed propeller at, 1050 rpm is driven by an engine delivering 1700 shp. The activity factor is 135. Make use of the supplied propeller performance chart.
8. How does the generation of lift force on a helicopter differ from that in case of an airplane? What are the similarities and variations in the two types? Make use of sketches / plots to elaborate your answer.