BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M.TECH   SEMESTER : I
BRANCH: SER   SESSION : MO/19

SUBJECT: SR502 ELEMENTS OF AERODYNAMICS

TIME: 3:00 HOURS   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)   Describe the physical meaning of divergence of velocity.   [5]
Q.1(b)   Differentiate between conservation and non conservation form of governing equations with   [5]
         examples.

Q.2(a)   Show the use of Bernoulli's equation in estimation of test section velocity from the settling   [5]
         chamber condition for closed circuit wind tunnel.
Q.2(b)   Connect the lift with circulation using suitable calculations. The outcome of the exercise should [5]
         lead to an important theorem.

Q.3(a)   Show the evolution of aerofoil shape, taking the help of a celebrated curve of C_d Vs Re.   [5]
Q.3(b)   Describe the Kelvin circulation theorem, and connect it suitably to explain the starting vortex [5]
         concept.

Q.4(a)   Differentiate between geometrical and aerodynamic twist. Hence extend the concept in   [5]
         explaining wash in and wash out for the wing.
Q.4(b)   Differentiate between lift curve slopes of a 2D and a 3D wing. Hence find out the relation of   [5]
         slopes between them.

Q.5(a)   Show that for a parallel flow through a straight channel, the velocity profile is parabolic.   [5]
Q.5(b)   Illustrate the displacement thickness with the help of suitable sketches and by taking an example [5]
         of a streamtube inserted in the boundary layer.

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