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17AE/AS752

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Wind Tunnel Techniques

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a.   Why similarity is needed in Wind Tunnel testing?   **(06 Marks)**
    b.   Define different Similarities.   **(06 Marks)**
    c.   Define Mach number, Reynold's number and Froude number and show that these are non - dimensional.   **(08 Marks)**

OR

2   a.   Explain Buckingham π1 - Theorem.   **(08 Marks)**
    b.   The variables controlling the motion of a floating vessel through water are the drag force F, the speed V , the length ℓ , the density ρ and viscosity μ of water and acceleration due to gravity g. Derive an expression for F by dimensional analysis.   **(12 Marks)**

Module-2

3   a.   Why Wind tunnels are required?   **(06 Marks)**
    b.   With neat diagram, explain the working principles of Open and Closed circuit Wind tunnels.   **(08 Marks)**
    c.   Explain the merit and demerits of Open and Closed Circuit Wind tunnel.   **(06 Marks)**

OR

4   a.   What are the special problems in testing at transonic speeds?   **(08 Marks)**
    b.   What is the difference between Blow down and Indraft wind tunnel? Explain with neat diagrams and list out its merits and demerits.   **(12 Marks)**

Module-3

5   Explain the following and how it is measured in wind tunnel, with neat sketches
    a.   Test section speed.   **(07 Marks)**
    b.   Horizontal buoyancy.   **(07 Marks)**
    c.   Flow angularity.   **(06 Marks)**

OR

6   a.   What is Turbulence?   **(06 Marks)**
    b.   How turbulence in wind tunnel is measured?   **(07 Marks)**
    c.   How to correct in Reynold's number from wind tunnel to flight?   **(07 Marks)**

Module-4

7   a.   Explain with neat sketches, internal six component strain gauge balance including the basic principle of measurement of forces and moments.   **(14 Marks)**
    b.   Explain how the balance is Calibrated.   **(06 Marks)**

OR

8 Write short notes on the following :
   a. Optical flow Visualization.   (07 Marks)
   b. Surface flow Visualization.   (07 Marks)
   c. Multi – Component Pressure measurement.   (06 Marks)

Module-5

9 Explain Wind tunnel model design with reference to the following
   a. Force measurement.   (06 Marks)
   b. Pressure measurement.   (07 Marks)
   c. Intake tests.   (07 Marks)

OR

10 a. Explain Store carriage and Separation tests.   (12 Marks)
     b. Explain briefly on Unsteady force and Pressure measurement.   (08 Marks)

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