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15AE752

Seventh Semester B.E. Degree Examination, June/July 2023
Wind Tunnel Techniques

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a. Give the classification of the fluid flows and describe.   (08 Marks)
     b. Describe the steps involved in the Buckingham's – Pi theorem to determine the non dimensional number with one example.   (08 Marks)

OR

2   a. Illustrate the similarity parameters between a model and the prototype used for wind tunnel testing.   (08 Marks)
     b. Explain briefly the following non-dimensional quantities:
         i)   Mach number
         ii)   Reynolds number
         iii) Froude number
         iv)   Euler number.   (08 Marks)

Module-2

3   a. Classify the wind tunnel based on followings:
         i)   Test section velocity
         ii)   Pressurization in the tunnel
         iii) Path for the air inside the tunnel
         iv)   Relation of test section and environment.   (08 Marks)
     b. Illustrate an open circuit subsonic wind tunnel and mention its advantages and disadvantages over closed circuit wind tunnel.   (08 Marks)

OR

4   a. Explain with the neat sketch the pressurized open circuit supersonic wind tunnel.   (08 Marks)
     b. Illustrate the continuous hypersonic wind tunnel and also list technological problems in designing and constructing it.   (08 Marks)

Module-3

5   a. List and explain any three flow angularity measurement methods in the wind tunnel.   (08 Marks)
     b. How do you calibrate the supersonic wind tunnel?   (08 Marks)

OR

6   a. Describe the method to obtain the test section velocity using pitot static probe in the subsonic wind tunnel.   (08 Marks)
     b. Illustrate the method to calculate instantaneous flow velocity using hot wire anemometer (constant voltage method).   (08 Marks)

Module-4

7   a. Describe the following wind tunnel balances:
    i)   Wire type balance
    ii) Struct – type balance
    iii) Plat form type balance
    iv) Strain gauge type balance.   (08 Marks)
    b. Illustrate the wind tunnel axes and body axes system, which are used to measure the aerodynamic forces end moments on the model in the wind tunnel.   (08 Marks)

OR

8   a. How the flow visualization techniques are classified? Describe the laser sheet technique of flow visualization used in wind tunnel.   (08 Marks)
    b. Explain the shadowgraph optical of flow visualization method.   (08 Marks)

Module-5

9   a. With help of neat sketch, describe the Intake test carried out for wind tunnel.   (08 Marks)
    b. Illustrate the procedure for store carriage and separation test for wind tunnel.   (08 Marks)

OR

10 a. How do you measure the unsteady forces and pressures at the test section and explain briefly.   (08 Marks)
    b. Enumerate the design of wind tunnel model and its features.   (08 Marks)

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