CBCS SCHEME

USN

15AE752

Seventh Semester B.E. Degree Examination, Dec.2023/Jan.2024
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. State the procedure to determine a non dimensional number using the Buckingham's P_i theorem. **(08 Marks)**

b. Explain the following non dimensional numbers :
   i) Mach number
   ii) Froude number
   iii) Euler numbers
   iv) Reynolds numbers. **(08 Marks)**

OR

2 a. Elucidate the dynamic similarity principle followed for wind tunnel testing with any example. **(06 Marks)**

b. With help of Buckingham P_i technique, obtain relation for lift on a wing in incompressible flow. **(10 Marks)**

Module-2

3 a. Explicate the blow down type supersonic wind tunnel with a neat sketch. **(10 Marks)**

b. Compare the open return and closed return wind runnels. **(06 Marks)**

OR

4 a. Discuss about losses occurs in supersonic tunnels. **(08 Marks)**

b. Elucidate the design and sizing parameters used for wind tunnels. **(08 Marks)**

Module-3

5 a. Describe the process involved during calibration of low speed wind tunnels. **(08 Marks)**

b. Interpret the role of hot wire anemometers in wind tunnel testing. **(08 Marks)**

OR

6 a. Explicate the types of flow angularity measurement in a wind tunnel test section. **(08 Marks)**

b. A subsonic wind tunnel of square test section runs at 30 m/s, with pressure 0.97 bar and temperature 22°C in the test section. A turbulence sphere with theoretical surface finish offering 4% blockage experiences critical Reynolds number at this state. Determine the test section height? [Take $\mu = 1.822 \times 10^{-5}$ kg/ms for 22°C]. **(08 Marks)**

Module-4

7 a. Mention the features and characteristics of wind tunnel balance. **(06 Marks)**

b. With help of eat sketch, explain the working principle of Schlieren flow visualization technique. **(10 Marks)**

OR

8 a. List down the pressure measuring devices used in wind tunnel testing. Explain it. **(10 Marks)**
b. Describe the wire type balance with neat sketch. **(06 Marks)**

Module-5

9 a. Illustrate the process involved for designing the wind tunnel model. **(10 Marks)**
b. Describe about store carriage and separation test done in wind tunnels. **(06 Marks)**

OR

10 a. Give the importance of intake tests wind tunnel. **(08 Marks)**
b. Demonstrate the unsteady pressure and force measurement from advanced wind tunnel techniques. **(08 Marks)**

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