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Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. The frictional torque T of a disc of diameter D at a speed N in a moving fluid of viscosity μ and density ρ in a turbulent flow is given by $D^5 N^5 \rho \phi\left(\frac{\mu}{D^2 N \rho}\right)$. Prove this by method of dimensions. (08 Marks)
- b. Define Non dimension/Dimensionless number. Derive an appropriate formula for Reynold's Number, Froude's Number, Euler's Number and Weber's Number, Mach number. (08 Marks)

OR

- 2 a. The pressure difference in a pipe of diameter D and length L due to the turbulent flow depends on Viscosity μ , velocity v , density ρ , roughness K . using Buckingham's theorem obtain an expression for ΔP . (08 Marks)
- b. Brief and classify about different types of similarity state and explain the process involved for solving the problems using Buckingham theorem. (08 Marks)

Module-2

- 3 a. Discuss in detail about Climate, Aero Acoustic, Water and Automobile Wind tunnel. (08 Marks)
- b. How are high Reynold's Number Wind Tunnel classified and what are all the different techniques used? Explain. (08 Marks)

OR

- 4 a. What are different types of Aeronautical Wind tunnels used in Industry? Classify and explain it based on the purpose. (08 Marks)
- b. List out and explain the basic parameters required for designing a wind tunnel and also describe how it is constructed. (08 Marks)

Module-3

- 5 a. Elaborate how speed of the wind tunnel will be calibrated with the help of pressure measurement techniques. (08 Marks)
- b. How turbulence inside a wind tunnel has an impact over test section, also explain how turbulence factor is calculated inside the test section. (08 Marks)

OR

- 6 a. Explain how wind tunnel data system works and also explain the process of calculation of physical parameter values using computer techniques. (08 Marks)
- b. Explain the context of horizontal bouyancy and flow Angularities and flow uniformity. (08 Marks)

Module-4

- 7 a. What are the different external balances used in wind tunnel for force and moment measurement? Explain in detail about it. (08 Marks)
b. Explain in detail with comparison about different surface flow visualization technique. (08 Marks)

OR

- 8 a. What are the different pressure measurements techniques used (or) followed to calculate the pressure over a body inside a wind tunnel? (08 Marks)
b. How velocity measurement is calculated using pressure probes for velocity measurements. (08 Marks)

Module-5

- 9 a. Explain in detail about store carriage and separation test. (08 Marks)
b. Explain the different advantages made in Wind tunnel testing. (08 Marks)

OR

- 10 a. List out basic requirement of basic model design of wind tunnel. (08 Marks)
b. Explain the requirement of unsteady force and pressure measurement in Wind tunnel. (08 Marks)
