



CBCS SCHEME

17AE752

Seventh Semester B.E. Degree Examination, June/July 2023 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. A wind tunnel is having a large rotating fan for a suction of air. The efficiency ' η ' of a fan depends on density ' ρ ' of the air, Dynamic viscosity ' μ ' of the air, Angular velocity ' ω ', Diameter ' D ' of the rotor and the discharge ' Q '. Using Buckingham's π - theorem express the efficiency ' η ' in terms of Dimensionless parameters. (12 Marks)
- b. Define Similarities and explain its types. (08 Marks)

OR

- 2 a. Explain the following terms and obtain expression :
i) Reynold's Number ii) Froude Number iii) Weber Number iv) Mach Number. (12 Marks)
- b. In an Aeroplane model of size 1/10 of its prototype, the pressure drop is 80N/cm². The model is tested in water. Find the corresponding pressure drop in the prototype. (Take $\rho_{\text{air}} = 1.24 \text{ kg/m}^3$, $\mu_{\text{water}} = 0.01 \text{ Poise}$ and $\mu_{\text{air}} = 0.00018 \text{ Poise}$). (08 Marks)

Module-2

- 3 a. Explain the Principle, Operation and parts of Low speed open Circuit Wind Tunnel with neat sketch. (10 Marks)
- b. Explain the Irregularities of flow in Low Speed Wind Tunnels. (10 Marks)

OR

- 4 a. Sketch the layout of Hypersonic Wind Tunnel and explain the principle and operation. (10 Marks)
- b. Explain about the following with relevant sketch :
i) Aero Acoustic Wind Tunnels ii) Environmental Wind Tunnels. (10 Marks)

Module-3

- 5 a. Explain the working and principle of Hot Wire Anemometer, with neat sketch. (10 Marks)
- b. Explain about steps and procedure for calibration of Low Speed Subsonic Wind Tunnel. (10 Marks)

OR

- 6 a. Describe the methods used for pressure and temperature measurement in Wind Tunnel. (10 Marks)
- b. Explain about Turbulence Measuring Methods. (10 Marks)

Module-4

- 7 a. Draw neatly and explain about Shadow graph and Schlieren flow Visualisation system. (12 Marks)
- b. Explain about following with relevant sketch :
i) Wire - type Balance ii) Strut - type Balance. (08 Marks)

OR

- 8 a. Discuss about various methods used for Visualisation of Low Speed Subsonic flow. (12 Marks)
b. Explain Velocity and Direction measurement in High Speed Wind Tunnels. (08 Marks)

Module-5

- 9 a. Explain about Unsteady Pressure Measurement Technique in Wind Tunnel. (10 Marks)
b. Explain about i) Intake Tests ii) Store Separation Testing. (10 Marks)

OR

- 10 a. Explain Flat Plat Boundary Layer Measurement with neat sketch. (10 Marks)
b. Explain about Rotating Tank Experiment with neat sketch. (10 Marks)
