

CBCS SCHEME

Librarian

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Learning Resource Centre
Charya Institute of Technology
18AE742

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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. The pipe of diameter 1.8 m is required to transport an oil of specific gravity 0.8 and viscosity 0.04 poise at the rate of $4 \text{ m}^3/\text{s}$. Tests were conducted on a 20 cm diameter pipe using water at 20°C . Find the velocity and rate of flow in the model. Viscosity of water at 20°C is 0.01 poise. (10 Marks)
- b. Explain the working of blow down type wind tunnel with its advantages and disadvantages. (10 Marks)

OR

- 2 a. The resisting force R of a supersonic plane during flight can be considered as dependent upon the length of the aircraft ' l ', velocity ' V ', air viscosity ' μ ', air density ' ρ ' and bulk modulus of air ' K '. Express the functional relationship between these variables and the resisting force. (10 Marks)
- b. Explain the structure of low speed closed circuit wind tunnel along with its working. (10 Marks)

Module-2

- 3 a. Elaborate how speed of the wind tunnel will be calibrated with the help of pressure measurement techniques. (10 Marks)
- b. Explain how turbulence factor is calculated inside the test section using turbulence sphere. (10 Marks)

OR

- 4 a. Explain the working principle of pressure sphere using neat sketch. (10 Marks)
- b. Explain the context of horizontal buoyancy and flow angularity in wind tunnel test section. (10 Marks)

Module-3

- 5 a. With neat sketch, explain wire type balance. (10 Marks)
- b. Explain the flow visualization methods adopted in subsonic wind tunnels. (10 Marks)

OR

- 6 a. Explain the working principle of multi tube manometer. (10 Marks)
- b. Explain the working principle of shadow graph with neat sketch. (10 Marks)

Module-4

- 7 a. Illustrate the working mechanism of particle image velocimetry. (10 Marks)
- b. Explain the concept of pressure measurement using pitot static probe. (10 Marks)

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- 8 a. Explain the working principle of Laser-Doppler Anemometry. (10 Marks)
b. Briefly explain the procedure of intake test in wind tunnel. (10 Marks)

Module-5

- 9 a. Explain the design consideration of a subsonic wind tunnel. (10 Marks)
b. Determine the losses in contraction cone of a wind tunnel. (10 Marks)

OR

- 10 a. Explain the procedure involved in calculating energy loss in cylindrical parts of a wind-tunnel. (10 Marks)
b. Explain the design consideration of a wind tunnel test section. (10 Marks)

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