CBCS SCHEME

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18AE742

Seventh Semester B.E. Degree Examination, Dec.2024/Jan.2025
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 resisting force R of a supersonic aircraft depends on the following properties. It depends on length of the aircraft 'l', velocity 'V', dynamic viscosity μ , density of air 'ρ' and bulk modulus of air 'K'. Express the function for resisting force using Buckingham' π theorem. **(10 Marks)**

b. Explain the structure of low speed wind tunnel along with its working. **(10 Marks)**

OR

2 a. Explain the types and function of wind tunnel. **(08 Marks)**

b. The variable controlling the motion of floating vessel through water are the drag force F, Speed V, the length l, the density ρ and viscosity μ of water and acceleration due to gravity g. Derive an expression for F by dimensional analysis. **(12 Marks)**

Module-2

3 a. Explain how turbulence factor is calculated inside the test section using turbulence sphere. **(10 Marks)**

b. A subsonic wind tunnel of square test section runs at 30 m/s with pressure 97.325 kPa and temperature 22°C, in the test section. A turbulence sphere with theoretical surface finish offering 4 percent blockage experiences critical Reynolds number at this state. Determine the test-section height. **(10 Marks)**

OR

4 a. What are the special problems in testing at transonic speed? **(10 Marks)**

b. Draw a schematic diagram and explain blow down supersonic tunnel. **(10 Marks)**

Module-3

5 a. Explain the working principle of multitube manometer. **(10 Marks)**

b. With neat sketch, explain wire type balancing. **(10 Marks)**

OR

6 a. With the neat sketch explain Schlieren process. **(10 Marks)**

b. Explain Intrusive and non-Intrusive method. **(10 Marks)**

Module-4

7 a. Explain the working principle of Laser Doppler Anemometry. **(10 Marks)**

b. Explain the concept of pressure measurement using pitot-static tube. **(10 Marks)**

OR

8 a. Write a short note on :
i) Optical flow visualization
ii) Surface flow visualization **(12 Marks)**

b. Explain the procedure of intake test in wind tunnel. **(08 Marks)**

Module-5

9 a. Explain the design consideration of wind tunnel test section. **(10 Marks)**

b. Explain the losses in contraction cone of a wind tunnel. **(10 Marks)**

OR

10 a. Explain design of various components of wind tunnel test chamber. **(12 Marks)**

b. Explain various wind tunnel components. **(08 Marks)**

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