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Question Paper Code : 40534

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Eighth Semester
Aeronautical Engineering
AE 6801 – WIND TUNNEL TECHNIQUES
(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. State Buckingham pi theorem.
2. Define Froude number and state its significance.
3. Write down the classifications of wind tunnels.
4. Name the factors which influence the design of supersonic tunnels.
5. If the model blockage is more than the allowable limit, what would be its effect ?
6. Define Strouhal number and state its importance.
7. What is the primary objective of tuft flow visualization ? And what is the disadvantages of his method ?
8. What is the principle behind optical flow visualization techniques ?
9. Name the instruments for unsteady pressure measurements.
10. What are the constraints for the model design ?

PART – B

(5×16=80 Marks)

11. a) i) A one fifth scale model automobile is tested in a wind tunnel in the same air properties as the prototype. The prototype velocity is 50 km/hr for dynamically similar conditions the model drag is 350N. What are the drag of the prototype automobile and the power in kW required to overcome this drag ? **(10)**
- ii) Discuss the various types of similarities that should be satisfied between a model and prototype. **(6)**

(OR)

- b) Assume that the drag D acting on a spherical object that falls very slowly through a viscous fluid is a function of the object diameter, d, the object velocity, V, and the fluid viscosity μ . Determine with the aid of dimensional analysis, how the drag depends on the object velocity ?

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12. a) Sketch the typical layout of a supersonic wind tunnel and mark all the components and subsystems. What is meant by starting problem in supersonic wind tunnels ?

(OR)

- b) With the aid of a neat sketch explain the hypersonic tunnel circuit. How is it different from supersonic tunnel ?

13. a) i) How do you measure the flow turbulence in wind tunnel ? Explain. (8)

- ii) What is meant by flow angularity ? How do you measure the same in wind tunnel ? (8)

(OR)

- b) Explain the calibration procedures for supersonic wind tunnels in brief.

14. a) With aid of schematic diagram explain the construction of compound balance. Name and sketch at least three types of flexures and three types of force element fastenings techniques.

(OR)

- b) Explain the basic principle of Laser Doppler anemometry. Show that the Doppler shift in frequency is directly proportional to the component of velocity in a direction of the reference vector.

15. a) How are the separation studies carried out using wind tunnels ? Explain in detail with suitable sketches.

(OR)

- b) With aid of suitable sketches explain the operation of pressure transducers.