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**18AE/AS742**

### 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. Write Buckingham's theorem and explain it briefly. What is the relationship of the effect on pressure drop ($\Delta P$) of the variables d, L, p, $\mu$, v. **(12 Marks)**
   b. Define the following non-dimensional numbers:
      i)    Force co-efficient
      ii)   Euler's number
      iii)  Reynolds number
      iv)   Moment coefficient. **(08 Marks)**

### OR

2  a. Explain the following:
      i)    Geometric similarity
      ii)   Kinematic similarity
      iii)  Dynamic similarity. **(12 Marks)**
   b. Obtain the expression for the following non-dimensional number:
      i)    Froude's number
      ii)   Mach's number
      iii)  Reynolds number. **(08 Marks)**

### Module-2

3  a. Explain briefly. How to determine flow angularity in wind tunnel (subsonic wind tunnel). **(06 Marks)**
   b. Explain the process of setting Mach number in a supersonic tunnel. **(04 Marks)**
   c. What is meant by low speed wind tunnel and supersonic tunnel? Explain briefly the parameters to be calibrated in each of them. **(10 Marks)**

### OR

4  a. Write a short notes on horizontal buoyancy, flow angularity and flow uniformity. **(10 Marks)**
   b. Explain with a neat sketch, working of Hot-wire anemometer. **(10 Marks)**

### Module-3

5  a. Briefly explain the following:
      i)    Tuft flow visualization
      ii)   Smoke flow visualization
      iii)  Oil flow visualization. **(08 Marks)**
   b. With the aid of a neat sketch, discuss in detail the working of u-tube manometer and multitube manometer. **(12 Marks)**

**OR**

6  a.  With a neat sketch explain the following:
      i)     A wire-type balance
      ii)    Strut-type balance
      iii)   Platform-type balance.                        **(15 Marks)**
   b.  What are the different types of pressure measuring devices? Explain briefly any one of them.
                                                                              **(05 Marks)**

### Module-4

7  Explain the principle of operation of laser-doppler anemometer. List out its advantages and limitation.                     **(20 Marks)**

**OR**

8  a.  Classification of Non-Intrusive flow measurement techniques.      **(08 Marks)**
   b.  Explain the principle of operation of particle image velocimetry. What are its advantages?
                                                             **(12 Marks)**

### Module-5

9  a.  Explain the challenges faced during the design of wind tunnel model.    **(10 Marks)**
   b.  List various components of wind tunnel and explain.         **(10 Marks)**

**OR**

10  a.  With a neat sketch, explain wind tunnel contractions and at an equation for contraction ratio.
                                                          **(10 Marks)**
   b.  Write a short note on: i) Honey comb    ii) The diffuser.       **(10 Marks)**

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