

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

**Course Code: AO409****Course Name: WIND TUNNEL TECHNIQUES**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any three full questions, each carries 10 marks*

Marks

- 1 a) Restate Buckingham Pi theorem. (2)
- b) The resisting force  $R$  of a supersonic plane during flight can be considered as dependent upon length of the aircraft  $l$ , velocity  $V$ , air viscosity  $\mu$ , air density  $\rho$ , and bulk modulus of air  $K$ . Using Buckingham's pi theorem, express the functional relationship between these variables and the resisting force. (8)
- 2 a) Define similarity. Enumerate about different types of similarities with neat sketch. Describe the scale effect of similarities. (5)
- b) Derive any five non-dimensional numbers which are mostly relevant for moving fluids. (5)
- 3 a) Explain about open and closed type wind tunnel. (10)
- 4 a) Explain in detail about classification and types of wind tunnel. (6)
- b) Illustrate the schematic layout and essential features of the intermittent blow-down wind tunnel. (4)

**PART B***Answer any three full questions, each carries 10 marks*

- 5 a) Derive the expression to determine the test section speed of the subsonic wind tunnel. (8)
- b) What is flow angularity? What are the associated instruments to measure flow angularity? (2)
- 6 a) Describe the calibration procedure for subsonic wind tunnel. (10)
- 7 a) Explain the concept of six –component balance system for force and moment calculations. (10)
- 8 a) Write in detail about principle and working of hot wire anemometry with neat diagram. (10)

**PART C**

*Answer any four full questions, each carries 10 marks*

- 9 Explain pressure measurements by using
- a) Manometer (5)
  - b) Pressure transducer (5)
- 10 a) Explain the designing of wind tunnel model by considering aerodynamic and structural aspects. (10)
- 11 a) Illustrate the general design features and various configurations of Shock tube tunnel. (10)
- 12 a) Enumerate the design considerations and performance study of smoke tunnel. (10)
- 13 a) Illustrate the various optical and non-intrusive techniques for the flow visualization. (10)
- 14 a) Explain the flow visualization using Particle Image Velocimetry with neat diagram. (10)

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