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



**End Semester Examination – Nov/Dec - 2017**

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| **Code :** | **14AE2026** | **Duration :** | **3hrs** |
| **Sub. Name :** | **WIND TUNNEL TECHNIQUES** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | How do you achieve uniform flow in Low speed tunnel test section? | CO1 | 2 |
| b. | Explain the construction principle of subsonic wind tunnel. | CO1 | 3 |
| c. | Classify the wind tunnels, based on Mach number and test section and elaborate any one subsonic wind tunnel with neat sketch. | CO1 | 15 |
| (OR) | | | | |
| 2. | a. | Differentiate incompressible flow from compressible flow. | CO1 | 2 |
| b. | State flow similarity. | CO1 | 3 |
| c. | A subsonic open- circuit wind tunnel runs with a test section speed of 40 m/s. The temperature of lab environment is 160 C. If a turbulent sphere measures the turbulent factor (TF) of the tunnel as 1.2, determine the sphere diameter. Assume the test section pressure as the sea-level pressure. | CO1 | 15 |
| 3. | a. | Calculate the compressed air storage time for 70 bar Pressure Vessel. | CO1 | 5 |
|  | b. | Classify the mode of operation in shock tube and by using shock tube explain the various test possibilities for societal needs. | CO2 | 15 |
| (OR) | | | | |
| 4. | a. | Define shock speed. | CO2 | 5 |
|  | b. | By using method of characteristics, explain the procedure followed to design C-D nozzle. | CO2 | 15 |
| 5. | a. | Explain the term “vaccum sizing” | CO2 | 5 |
|  | b. | Elaborate hypersonic wind tunnel working principle and design procedures with neat layout. | CO2 | 15 |
| (OR) | | | | |
| 6. | a. | Differentiate Shadowgraph from Schlieren technique. | CO3 | 5 |
|  | b. | By using color Schlieren, explain the flow visualization technique to capture moving shock of Mach2 Flow. | CO3 | 15 |
| 7. | a. | Classify the method of pressure measurement techniques followed in the Wind tunnel. | CO2 | 4 |
|  | b. | Elaborate the instruments used to measure the pressure in low speed tunnel with neat sketch. | CO2 | 16 |
| (OR) | | | | |
| 8. | a. | Discuss the Working Principle of Hot wire anemometry with neat figure. | CO3 | 10 |
|  | b. | What is wind tunnel model sizing? Explain the model sizing with neat figure. | CO2 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Draw the force and moment diagram of airfoil at zero angle of attack. | CO3 | 2 |
|  | b. | Define Center of Pressure and Aerodynamic Center. | CO3 | 3 |
|  | c. | By using six component balance, how do you measure different forces acting on climbing flight in tunnel? Elaborate it with neat sketch. | CO3 | 15 |