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

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**End Semester Examination – Nov/Dec– 2018**

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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. | A thin rectangular plate having a width ‘w’ and a height ‘h’ is located so that it is normal to a moving stream of fluid the drag ’D’ that the fluid exerts on the plate is a function of ‘w’ and ‘h’ the fluid viscosity and density’µ” and ‘ρ’ respectively, and the velocity ‘V ‘of the fluid approaching the plate. Determine a suitable expression for drag force. | CO1 | 12 |
| b. | Write the advantages and disadvantages of Open and Closed Circuit Wind Tunnels. | CO1 | 8 |
| (OR) | | | |  |
| 2. | a. | How are the wind tunnels classified? What are the special problems of testing in hypersonic wind tunnels? | CO1 | 10 |
| b. | The thrust F of a given propeller depends upon its diameter d, speed of advance v, revolutions per second N, the fluid density ρ, and viscosity μ. Find an expression for F in terms of these quantities. | CO1 | 10 |
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| 3. | a. | Illustrate the working of Blow down wind tunnel with its merits and demerits. | CO2 | 10 |
| b. | In a supersonic wind tunnel of the following configuration, it is desired to simulate a flow of Mach number ,M = 3.0, p = 0.680bar in a cross section of 30cm2 by taking compressor supply from 1bar and 30°C.Determine the resultant test section temperature and the power required to operate the wind tunnel. | CO2 | 10 |
| (OR) | | | |  |
| 4. | a. | Compare Indraft and pressure driven wind tunnel. | CO2 | 6 |
| b. | Differentiate between intermittent wind tunnel and continuous wind tunnel. | CO2 | 6 |
| c. | Explain the working of closed circuit supersonic wind tunnel. | CO2 | 8 |
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| 5. | a. | Describe the working of interferometer in supersonic wind tunnel. | CO3 | 10 |
| b. | Elaborate the function of Schlieren Technique for supersonic flow visualization. | CO3 | 10 |
| (OR) | | | |  |
| 6. | a. | Outline the construction and working of Shadowgraph Technique. | CO3 | 10 |
| b. | Describe the function of Color Schlieren system with neat sketch. | CO3 | 10 |
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| 7. | a. | Illustrate the working of pressure transducer. | CO3 | 6 |
| b. | How the pressure sensitive paints are used for the pressure measurement. | CO3 | 6 |
| c. | Explain the three basic phenomenons occur in thermocouple. | CO3 | 8 |
| (OR) | | | |  |
| 8. | a. | Describe the working of Hot wire anemometer with neat sketch and explain the two modes of it. Why are hot wire anemometers preferred for measurement in the low velocity regimes? | CO3 | 10 |
| b. | Design a suitable static probe for static pressure measurement in a supersonic flow field. | CO3 | 10 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | In a shock tube experiment using air at 1× 105 N/m2 and 310K as the test gas, a pressure ratio of 29 across the wave was observed. Find the stagnation temperature and pressure behind the propagating shock wave. | CO2 | 12 |
| b. | Explain the working of shock tube with the theoretical calculations. | CO2 | 8 |