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



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **14AE2021** | Duration : | **3hrs** |
| **Sub. Name :** | **GAS DYNAMICS** | Max. marks : | **100** |

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

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. |  | Air enters a CD nozzle at 1.0 MPa and 800 K with a negligible velocity. The flow is steady, one dimensional and isentropic with an exit nozzle exit Mach number of 2 and throat area of 20 cm2. Determine   1. Throat condition( pressure, temperature, density and velocity). 2. Exit plane conditions( pressure, temperature, density and velocity). 3. Mass flow rate. | CO1 | 7  7  6 |
| **(OR)** | | | | |
| 2. |  | Explain speed of sound and derive an expression of speed of sound with suitable assumptions. | CO1 | 20 |
| 3. |  | Derive the **Rankine – Hugonoit** relationship for density, pressure and temperature before and after normal shock. | CO2 | 20 |
| **(OR)** | | | | |
| 4. | a. | Derive an expression of area-velocity relation and discuss the results. | CO1 | 10 |
|  | b. | Explain the effects of pressure ratio in nozzle performance and discuss notable flow conditions with a suitable plot. | CO1 | 10 |
| 5. |  | Derive the expression of Prandtl - Meyer function using governing equations. | CO2 | 20 |
| **(OR)** | | | | |
| 6. |  | Air flow at Mach 3 and pressure 105 N/m2 is turned abruptly by a wall into the flow with a turning angle of 25deg, as shown in fig. below.If the shock is reflected by another wall determine the flow properties M and p downstream of the reflected shock. | CO2 | 20 |
| 7. | a. | Explain tip effects of wing with a neat sketch. | CO3 | 5 |
|  | b. | Discuss about Transonic Area rule. | CO3 | 10 |
|  | c. | State Divergence mach number. | CO3 | 5 |
| **(OR)** | | | | |
| 8. | a. | Discuss the significance of critical and drag divergence mach number. | CO3 | 10 |
|  | b. | Discuss the advantages and disadvantages of swept wing. | CO3 | 10 |
|  | | **Compulsory:** |  |  |
| 9. |  | Derive and explain the Prandtl-Glauert transformation for Subsonic flow. | CO3 | 20 |