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



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

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| **Code :** | **14AE2017** | **Duration :** | **3hrs** |
| **Sub. Name :** | **AIRCRAFT PROPULSION** | **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. | With a neat sketch, explain the Brayton cycle with intercooling, reheating, and regeneration. | CO2 | 10 |
| b. | Classify aircraft jet engine. Mention the important characteristics of each. | CO2 | 10 |
| **(OR)** | | | | |
| 2. |  | A Brayton cycle works between 0.9 bar, 290 K and 6 bar, 1300K. There are two stages of compression with perfect inter cooling and two stages of expansion. The work out of first expansion stage being used to drive the two compressors, where the interstate pressure is optimized for the compressor. The air from the first stage turbine is again heated to 1300K and expanded. Calculate the power output of free power turbine and cycle efficiency without and with a perfect heat exchanger and compare them. Also calculate the percentage improvement in the efficiency because of the addition of heat exchangers. | CO1 | 20 |
|  |  |  |  |  |
| 3. |  | An axial flow air compressor of 50 % reaction design had blades with inlet and outlet angles of 40˚and 12˚ respectively. The compressor is to produce a pressure ratio of 7:1 with an overall isentropic efficiency of 0.87 when inlet static temperature is 35˚C. The blade speed and axial velocity are constant throughout the compressor. Assuming a value of 250 m/s for blade speed, find the number of stages required if the work done factor is:  i) Unity ii) 0.87 for all stages. | CO1 | 20 |
| **(OR)** | | | | |
| 4. | a. | Differentiate between axial and centrifugal compressor. | CO2 | 6 |
| b. | Mention the need for multistaging in a axial compressor. | CO2 | 4 |
| c. | Explain the surging and stalling of a axial compressor. | CO2 | 10 |
|  |  |  |  |  |
| 5. |  | Gas with a velocity of 220 m/s relative to blades enters an impulse moving row at an angle of 55° with respect to axial direction. The tangential velocity of blades is 160 m/s. The work developed in blades is estimated as 60 kJ/kg of gas. Find the blade efficiency and the blade friction coefficient for relative velocities. Assume symmetrical blades. | CO1 | 20 |
| **(OR)** | | | | |
| 6. | a. | Explain the working principles and components of an impulse and reaction turbines. | CO2 | 12 |
| b. | Derive the turbine efficiency of a single stage axial turbine. | CO2 | 8 |
|  |  |  |  |  |
| 7. |  | Explain the types of combustion chamber of a gas turbine engine. Explain the factors affecting the combustion chamber performance. | CO2 | 20 |
| **(OR)** | | | | |
| 8. |  | Explain the general matching procedure for a two spool turbojet engine. | CO2 | 20 |
|  | | **Compulsory**: |  |  |
| 9. | a. | State the assumption made in the matching procedure of a single spool turbojet engine. | CO2 | 10 |
| b. | Briefly explain the operational principle of the supersonic inlet with typical modes of inlet operations. | CO2 | 10 |