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

****

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

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **14AE2014** | **Duration :** | **3hrs** |
| **Sub. Name :** | **AIRCRAFT PERFORMANCE** | **Max. Marks :** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain with neat sketch the aerodynamic moment and force generated by an airfoil. | CO1 | 12 |
| b. | Derive the equation of drag polar for complete aircraft and explain its significances. | 08 |
| **(OR)** | | | | |
| 2. | a. | Illustrate the types of Drag occurred in transonic region and its reduction techniques with neat sketch. | CO1 | 10 |
| b. | Consider a straight wing of aspect ratio 6 with an NACA 2412 airfoil. Assuming low-speed flow, calculate the lift coefficient at an angle of attack of 6°. For this wing, the span effectiveness factor e1 = 0.95. Take ao=0.105 per degree, αo= -2.2 deg. | 10 |
|  |  |  |  |  |
| 3. |  | Explain the working principle of a Piston engine and the variation of its performance characteristics with velocity and altitude. | CO2 | 20 |
| **(OR)** | | | | |
| 4. |  | Explain the working principle of a Turbo –Prop engine and the variation of its performance characteristics with velocity and altitude. | CO6 | 20 |
|  |  |  |  |  |
| 5. | a. | Calculate the minimum power required and the velocity at which it occurs for the given airplane weighing 35,000kg flies at the altitude of 30,000 ft. Consider the following parameters : ρ = 0.4135 Kg/m3,  S = 88 m2 , AR= 5.92, CDo= 0.012, and K = 0.02. | CO3 | 10 |
| b. | Derive the equation for minimum thrust required condition and its corresponding velocity. | 10 |
| **(OR)** | | | | |
| 6. | a. | Derive the equation of maximum rate of climb and its corresponding velocity for jet propelled aircraft. | CO3 | 16 |
| b. | Draw the Hodograph and explain its significances. | 04 |
|  |  |  |  |  |
| 7. | a. | Derive the Brequte Endurance equation for Jet propelled aircraft and its corresponding velocity equation. | CO4 | 10 |
| b. | Derive the maximum load factor for the aircraft in the given altitude. | 10 |
| **(OR)** | | | | |
| 8. | a. | Explain the different type of high lift devices used in aircraft and its significances. | CO4 | 10 |
| b. | Derive the equation for Pull up maneuver and explain its characteristics with suitable diagram. | 10 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Derive the expression to estimate the Takeoff ground roll distance. | CO5 | 10 |
| b. | Calculate the total landing distance for our Gulfstream-like airplane at standard sea level, assuming that (for conservatism) the landing weight is the same, as the takeoff gross weight of 33,113 kg. Assume that no thrust reversal is used and that the runway is dry concrete with a brakes-on value of µr = 0.4. The approach angle is 3° and Clmax is 2.4 | 10 |