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

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

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| **Code :** | **17AE2013** | **Duration :** | **3hrs** |
| **Sub. Name :** | **AIRCRAFT PERFORMANCE** | **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. | Derive the equation of position of Aerodynamic center. | CO1 | 10 |
| b. | Illustrate the Aerodynamic characteristics of low Aspect Ratio wing. | 10 |
| **(OR)** | | | | |
| 2. | a. | Explain the different types of Drag and its reduction techniques with neat sketch. | CO1 | 12 |
| b. | Derive the equation of drag polar for complete aircraft and explain its significances. | 08 |
| 3. | a. | Explain the working principle of a Turbo-Fan engine and the variation of its performance characteristics, with velocity and altitude. | CO2 | 20 |
| **(OR)** | | | | |
| 4. | a. | Explain the working principle of a Turbo –Prop engine and the variation of its performance characteristics, with velocity and altitude. | CO6 | 20 |
| 5. | a. | Derive the Equation of motion of an aircraft and deduce it to steady and level flight condition. | CO3 | 06 |
| b. | For the Gulfstream IV aircraft at the conditions of 30,000 ft, ρ = 0.4196 Kg/m3 assuming a weight of 33,113 Kg. Airplane data: S = 88 m2, AR= 5.92, C do = 0.015, Wing efficiency e = 0.95. Calculate the minimum thrust required and the velocity at which it occurs. | 08 |
| c. | Derive the Brequte Range equation for Jet propelled aircraft and its corresponding velocity equation. | 06 |
| **(OR)** | | | | |
| 6. | a. | For the given Airplane equipped with Turbo-Jet engine flying at sea level. Consider the following parameters of the aircraft CD = 0.018 + 0.06 CL2, Thrust to weight ratio is 0.379 and wing loading is 350 N/m2  Calculate the following:   1. Velocity at maximum climb angle 2. Velocity at maximum Rate of climb 3. Maximum Rate of climb | CO3 | 12 |
| b. | Explain the different type of high lift devices used in aircraft and its significances. | 08 |
| 7. | a. | Derive the level turn radius and turn rate of the aircraft. | CO3 | 10 |
| b. | For the given Airplane equipped with Turbo-Jet engine flying with the velocity of 80 m/s at the altitude of 30,000 ft. Consider the following parameters of the aircraft CD = 0.018 + 0.06 CL2, Thrust to weight ratio is 0.379 and wing loading is 350 N/m2.Take ρ = 0.4135 Kg/m3. Calculate the maximum load factor of the aircraft. | 10 |
| **(OR)** | | | | |
| 8. | a. | Derive the minimum turn radius and maximum turn rate for the aircraft in the given altitude. | CO3 | 12 |
| b | Derive the equation for Pull down maneuver and explain its characteristics with suitable diagram. | 08 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Explain about different landing assistance devices in an airplane. | CO3 | 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 |