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



**End semester ExaminationNov/Dec – 2017**

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| **Code :** | **14AE3004** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FLIGHT PERFORMANCE AND 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. | a. | During a flight test for climb performance, the following readings were Observed at two altitudes:   |  |  |  | | --- | --- | --- | | Observation | Record 1 | Record 2 | | Indicate altitude (m) | 1,300 | 1,600 | | Ambient temperature (oC) | 16 | 14 |   The altimeter is calibrated according to ISA. Use hydrostatical equation obtains the true Difference of height between the two indicated altitudes | CO1 | 10 |
| b | Derive the general Hydrostatic Equation. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | Explain the various types of drag. | CO1 | 8 |
| B | Derive the equation for Drag Polar and explain with neat sketch. | 12 |
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| 3. | a. | An Airplane weights 1,58,00N and has a wing planform area of 90m2its dragpolar is of the form Cd = 0.015+0.08 Cl2 During cruise at an altitudeof 3 Km(take ℓ=0.179 Kg/m3) its engine suddenly fails and it is forced todescend downin a powerless glider. Calculate   1. The minimum glide path angle 2. The maximum range cover over the ground 3. The equilibrium glide velocity at that altitude corresponding to minimum glide angle | CO1 | 20 |
| (OR) | | | | |
| 4. | a. | Derive Brequette Rang and Endurance equation for propeller driven airplane | CO1 | 12 |
| b. | Obtain the gross still air range in steady level flight for a turboprop airplane flying at a constant speed of 400 kmph at an altitude where ρ = 0.65, given that:CD = 0.021 + 0.06CL2 ; W1 = 176, 600 N, Wfuel = 35, 300 N,S = 90 m2, ŋp = 0.82, BSFC = 3.90 N/kW - hr. | CO1 | 8 |
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| 5. | a. | Explain the Signification for V-N Diagram | CO1 | 8 |
| b. | Obtain the expression for wing contribution to static longitudinal stability and give your comments on this expression | CO1 | 12 |
| (OR) | | | | |
| 6. | a. | An aircraft weighing 25 kN has a wing area of 80 m2 and its drag coefficient is CD = 0.016 + 0.04 CL 2 , calculate the minimum thrust required for straight and level flight, and the corresponding true air speed. At sea level and at 10 km (ρ= 0.58kg/m3). Calculate also the minimum power required and the corresponding true air speeds at the above conditions. | CO1 | 10 |
| b. | A wing body model is tested in a subsonic wind tunnel .the lift is found to be zero at a geometrical angle of attack is -1.5 deg. At angle of attack 5 deg the cl is measured 0.52 the moment coefficient about the CG is measured as -0.01 and 0.05 for angle of attack is 1 deg and 7.88 deg respectively. The C.G is located at 0.35C.Calculate the location of the aerodynamics center and the value CM. | CO1 | 10 |
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| 7. | a. | Elaborate the term stick force gradient and discuss the effects in the trim condition of the aircraft. | CO2 | 8 |
| b. | Derive the Stick-Free Elevator Angle. | CO2 | 8 |
| c. | Derive Stick fixed Neutral point of the Aircraft. | CO2 | 4 |
| (OR) | | | | |
| 8. | a. | What is Aerodynamic Balancing? And Explain it | CO2 | 12 |
| b. | Explain the following terms with neat sketch  i. One Engine Inoperative conditions ii. Rudder Lock. iii. Adverse yaw. iv. Spin Recovery. | CO2 | 8 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Explain the phenomena of Aileron reversal | CO2 | 10 |
| b. | Explain the following term  i. Spin. ii. Spiral Instability. | CO2 | 10 |

ALL THE BEST