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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**Supplementary Examination – June – 2017**

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| **Code :** | **14AE2015** | **Duration :** | **3hrs** |
| **Sub. Name :** | **AIRCRAFT STABILITY AND CONTROL** | **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 contribution of aircraft Tail stick fixed static longitudinal Stability. | CO2 | 15 |
| b. | Derive Stick fixed Neutral point. | 5 |
| (OR) | | | | |
| 2. |  | A wing section being tested in a wind tunnel is hinged at its leading edge,with freedom to rotate about the hinge axis. Calculate the equilibrium floating angle of the wing at a tunnel speed of 100 kmph, given that: wing weight is 250 N/m2, c.g. location at 0.4 c, a.c. location at 0.24c, Cmac = -0.04, αol = -30,dCl / dα = 0.105 deg-1. Assume standard sea level conditions. Is the equilibrium statically stable? | CO2 | 20 |
| 3. | a. | What is Hinge Moment? | CO2 | 2 |
| b. | Derive the stick free Elevator Angle | 4 |
| c. | Derive the contribution of the wing and Tail in Stick free Longitudinal Stability. | 14 |
| (OR) | | | | |
| 4. |  | An airplane is equipped with a wing of aspect ratio 6 (Clαw = 0.095) and span efficiency factor e of 0.78, with an airfoil section giving Cmac = 0.02.Calculate, for CL between 0 and 1.2, the pitching moment coefficient of the wing about the c.g. which is located 0.05 c ahead of a.c. and 0.06 c under a.c.. Repeat the calculations when chord wise force component is neglected. Assume CDow = 0.008, αolw= 10,iw = 50. | CO2 | 20 |
| 5. | a. | Derive the static Directional stability derivatives for tail part. | CO2 | 10 |
| b. | How the Adverse Yaw occurs? Elaborate how to avoid it. | 10 |
| (OR) | | | | |
| 6. | a. | Derive the required Rudder angle for Equilibrium condition. | CO3 | 10 |
| b. | Elaborate the term One Engine Inoperative condition. | 10 |
| 7. | a. | Derive the Aileron Deflection Factor. | 16 |
| b. | Define Dihedral Angle and Explain the effects in lateral Stability. | 4 |
| (OR) | | | | |
| 8. | a. | Derive the Equation of motion for dynamic longitudinal stability. | CO3 | 14 |
| b. | Explain the term Routh’s Criteria. | 6 |
|  | | **Compulsory**: |  |  |
| 9. |  | Explain the following term  a. Dutch Roll.  b. Auto Rotation. | CO3 | 20 |