Reg. No.

Question Paper Code : X10033

B.E./B.Tech. DEGREE EXAMINATIONS NOVEMBER / DECEMBER 2020

Fifth Semester

Aeronautical Engineering

AE8501 – Flight Dynamics

(Common to Aerospace Engineering)

(Regulations 2017)

Time: 3 Hours   Answer ALL Questions   Max. Marks 100

PART- A (10 x 2 = 20 Marks)

1. Define Induced drag.
2. What is meant by drag polar?
3. Define range and endurance.
4. Define load factor and explain its significance.
5. Define the terms maneuverability and controllability in aircraft.
6. Define neutral point.
7. What is dihedral effect?
8. Define adverse yaw and explain how it is controlled by rudder.
9. Define Autorotation.
10. Define Dutch roll.

PART- B (5 x 13 = 65 Marks)

11. a)   i.   Derive the condition for minimum drag and power required in
             straight and level flight**.**   **(7)**
         ii. Describe the different types of drag experienced by an aircraft. **(6)**

(OR)

     b)   i.   Derive the rigid body equation of motion for a flight vehicle**.**   **(7)**
         ii. Explain how thrust and power varies with change in velocity and
             altitude.   **(6)**

12. a) Derive the Brequet Range and endurance equation for a jet and propeller aircrafts.

(OR)

b)   i.   Explain the terms

       1. Radius of turn. **(2)**
       2. Aircraft speed. **(2)**
       3. Load factor. **(2)**
       4. Bank angle. **(2)**

   ii.   Explain V-n diagram with gust loads. **(5)**

13. a)   i.   Explain the influence of CG location towards the stability criterion of an aircraft. **(7)**
     ii.   Discuss the purpose of different controls in aircraft. **(6)**

(OR)

b)   i.   Explain in detail about inherently stable and marginal stable aircrafts. **(7)**
     ii.   Write a short note on:
       1. Stick force **(2)**
       2. Stick force gradient **(2)**
       3. Stick force per 'g' **(2)**

14. a)   i.   Explain the coupling between rolling and yawing in detail. **(7)**
     ii.   Describe requirements of rudder in detail. **(6)**

(OR)

b)   i.   Write short notes on
       1. Aileron reversal **(3)**
       2. Rudder lock **(3)**
     ii.   Write short note on one engine inoperative condition in Aircraft. **(7)**

15. a) Explain the following :
       1. Stick free condition **(4)**
       2. Spiral divergence **(3)**
       3. Dutch roll **(3)**
       4. Phugoid motion **(3)**

(OR)

b) Write short notes on:
1. Modes of stability **(5)**
2. Spin & recovery from spin **(5)**
3. Autorotation **(3)**

PART- C (1 x 15 = 15 Marks)

16. a) Show that the maximum rate of climb for a propeller driven airplane is
$R/C_{max}=[(\eta_{pr} \times p)/w]-V_{R/C_{max}}[1.155/(L/D)_{max}]$.

(OR)

b) Explain the relationship between the lift and its drag on an aircraft from low speed to high speeds using drag polar