



10AE81

**Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020**  
**Flight Vehicle Design**

Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting at least TWO full questions from each part.**

**PART – A**

- 1 a. Explain the process of designing an aircraft with the help of a flow chart. (10 Marks)  
b. Calculate the near exact weight of an airplane from a guess value for the following data, where  $W_e$  is the empty weight and  $W_o$  is the take-off weight.

$$\frac{W_e}{W_o} = 0.8835 W_o^{-0.07} \quad \text{and} \quad W_o = \frac{10800}{0.613 - \frac{W_e}{W_o}} \quad (10 \text{ Marks})$$

- 2 Explain the effect of wing loading on stall speed, take-off distance, landing distance, range and flight ceiling. (20 Marks)

- 3 a. Explain the airfoil shape selection criteria. (10 Marks)  
b. Show that for a straight, tapered wing, Mean Aerodynamic Chord (MAC) is

$$\bar{C} = \frac{2}{3} C_r \left[ \frac{\lambda^2 + \lambda + 1}{\lambda + 1} \right], \quad \text{where } \lambda \text{-taper ratio and } c_r \text{ is root chord and derive the value for } \lambda_{x/c} \text{ and } \lambda_{c/4}. \quad (10 \text{ Marks})$$

- 4 a. Explain the propulsion selection criteria. (10 Marks)  
b. Write a note on a "Installed Thrust Correction". (10 Marks)

**PART – B**

- 5 a. Write the equation and motion of landing roll and obtain an expression for landing ground roll distance. (10 Marks)  
b. Explain passive and active lift enhancement. (10 Marks)

- 6 a. Explain 'aft tail design' effects in longitudinal stability of an aircraft. (10 Marks)  
b. Explain the criteria for rudder area sizing. (10 Marks)

- 7 a. Write a note on anti icing and De-icing system. (10 Marks)  
b. Explain the characteristics of a fuel system. (10 Marks)

- 8 Write short notes on:  
a. Communication system  
b. Navigation system  
c. Weapon system. (20 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.