USN | | | | | | | | | | |

10AE81

# Eighth Semester B.E. Degree Examination, June/July 2015

## Flight Vehicle Design

Time: 3 hrs. Max. Marks:100

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



### PART – A

1 a. Explain overview of airplane design process. **(08 Marks)**

b. Calculate near exact weight for an airplane from a guess value for the following data, where $W_e$ is the empty weight and $W_o$ is the takeoff weight.

$$\frac{W_e}{W_o} = 0.97\ W_o^{-0.05} \text{ and } W_o = \frac{10{,}500}{1 - 0.4 - \frac{W_e}{W_o}}$$ **(12 Marks)**

2 Explain the effect of wing loading on stall speed, take off distance, catapult take – off, landing distance, cruise, loitter for endurance, instantaneous turn and sustain turn. **(20 Marks)**

3 a. Explain the wing sweep angle selection criteria? **(10 Marks)**

b. Draw layout of a spread sheet for wing design. **(10 Marks)**

4 a. What are engine installed thrust correction? **(10 Marks)**

b. A jet engine performance data is given below :
rpm = 9500
EGT = 450°C
$w_f$ (fuel consumption) = 1850 Kg/hr
$w_a$ = (air consumption) = 91 Kg/Sec
$F_n$ (net thrust) = 4510 Kg
TFSC (thrust specific fuel consumption) = 0.5
The test is carried out at pressure of 102.6 kPa and ambient temperature of 30° C. Correct the test data for ISA conditions (pressure 101.3 kPa and temperature 15° C) **(10 Marks)**

### PART – B

5 a. What is balanced field length? **(06 Marks)**

b. Draw spread sheet layout for take – off and landing distance. **(14 Marks)**

6 a. Explain rudder area sizing. **(12 Marks)**

b. What is neutral point, c.g. margin and static margin? **(08 Marks)**

7 a. Explain Alternating current electrical power system for an aircraft. **(10 Marks)**

b. What is Castoring – wheel geometry? **(10 Marks)**

8 a. Explain a typical flight control system. **(12 Marks)**

b. Briefly describe weapon carriage and gun installation on military aircraft. **(08 Marks)**

* * * * *