CBCS Scheme

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

15AE63

Sixth Semester B.E. Degree Examination, June/July 2018
Aircraft Performance

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Derive three equations which describe the translational motion of an airplane through three dimensional space over a flat earth. **(05 Marks)**

b. Calculate the power required curve @ 30,000 ft with the following data:
$\rho_\infty = 8.9068 \times 10^{-4}$ slug/ft^3
W = 73000 lb, S = 950 ft^2, AR = 5.92, C_{DO} = 0.015 and K = 0.08 and plot the graph. **(11 Marks)**

OR

2 Calculate and plot thrust required curve and prove graphical approach is equal to analytical approach with following data:
Altitude = 30,000 ft, W = 73000 lb, S = 950 ft^2, AR = 5.92, C_{DO} = 0.015, K = 0.08, $\rho_\infty = 8.9068 \times 10^{-4}$ slug/ft^3 **(16 Marks)**

Module-2

3 a. With neat diagram, illustrate absolute and service ceilings. **(08 Marks)**

b. Derive the expression for t_{min}. **(08 Marks)**

OR

4 a. Derive the expression for Gliding flight unpowered. **(10 Marks)**

b. With neat diagram, illustrate the excess power for, (i) Propeller driven airplane (ii) Jet-propelled airplane. **(06 Marks)**

Module-3

5 a. Derive Aerodynamic relations associated with maximum $\frac{C_L}{C_D}$, $\frac{C_L^{\frac{3}{2}}}{C_D}$ and $\frac{C_L^{\frac{1}{2}}}{C_D}$. **(12 Marks)**

b. Define Range and describe different types of weight. **(04 Marks)**

OR

6 a. Derive Breguet range equation. **(12 Marks)**

b. For an airplane with a propeller / reciprocating engine power plant, how do you obtain the largest possible range? **(04 Marks)**

Module-4

7 a. Describe intermediate segments of ground roll **(06 Marks)**

b. Derive Sg by showing typical variation of forces acting on an airplane during takeoff. **(10 Marks)**

OR

8 a. Describe landing path and landing distance. **(06 Marks)**

b. Calculate the total landing distance for airplane assuming that the landing weight is the same as the take off gross weight of 73000 lb. Assume no thrust reversal is used and that the runway is dry concrete with brakes on value of $\mu_r = 0.4$. The approach angle is 3°
Given data: $\rho = 0.002377$ slug/ft^2, $C_{L_{max}} = 2.39$, $S = 950$ ft^2, $g = 32.3$, $G = 0.588$, $K_1 = 0.02$, $C_L = 0.1$, $\Delta C_{DO} = 0.0177$, $C_{DO} = 0.015$, $e = 0.9$, $AR = 5.92$, $N = 3$ **(10 Marks)**

Module-5

9 a. Describe two performance characteristics of greatest importance in turning flight. **(02 Marks)**

b. Derive the expression for minimum turn radius and maximum turn rate. **(14 Marks)**

OR

10 a. Derive expression for pull up and pull down Maneuvers. **(08 Marks)**

b. Explain V-n diagram. **(08 Marks)**

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