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Total No. of Questions: [09]

Total No. of Printed Pages: [01]

B. Tech. (Aeronautical Engineering) (Semester – 4th)
AIRCRAFT PERFORMANCE
Subject Code: BANES1-401
Paper ID: [18110215]

Time: 03 Hours

Maximum Marks: 60

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A

(2 marks each)

- Q1. Attempt the following:
- (a) Geopotential altitude and Geometric altitude
 - (b) IAS and EAS
 - (c) Mach Number and Critical Mach number
 - (d) Troposphere and Stratosphere
 - (e) Downwash and Upwash
 - (f) Symmetrical airfoil and Cambered airfoil
 - (g) Aerodynamic Center and Centre of pressure
 - (h) Absolute Ceiling and Service Ceiling
 - (i) Geometric angle of attack and absolute angle of attack
 - (j) Decision speed and Terminal speed

Section – B

(5 marks each)

- Q2. Calculate the standard atmospheric values of T, p and ρ at a geo-potential altitude of 22 km. The value of Lapse rate in gradient atmospheric region is 6.5 K/km.
- Q3. Define drag. Explain 'form drag' and 'induced drag'. (1,4)
- Q4. Explain the concept of energy height. Using specific excess power plots, show the path followed for rate of climb and energy climb. (2,3)
- Q5. Derive expression for take-off distance.
- Q6. Explain Delta wing aerodynamics at low speed with the help of neat & labelled diagram. Explain lift curve for the same.

Section – C

(10 marks each)

- Q7. Define sweep angle, aerodynamic twist, aspect ratio, taper ratio & wing planform and explain effect of these factor on aerodynamic characteristics of wing. (5,5)
- Q8. Write notes on the following: (3,4,3)
- (a) High lift devices
 - (b) Various types of stalling behavior of wing
 - (c) Hodograph for climbing flight
- Q9. An aircraft with a weight of 200000N, planform area of 60 m² and drag polar as $C_D = 0.014 + 0.08C_L^2$ is flying at an altitude of 8 km ($\rho = 0.526 \text{ kg-m}^{-3}$). Calculate Lift coefficient, Drag coefficient, Velocities, Induced drag & profile drag for minimum drag condition & minimum power condition.