

**Roll No.**

**Total No. of Pages : 02**

**Total No. of Questions : 09**

**B.Tech.(ANE) (Sem.-5)**  
**AIRCRAFT PERFORMANCE**

**Subject Code : ANE-315**

**M.Code : 60524**

**Time : 3 Hrs.**

**Max. Marks : 60**

### INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

## SECTION-A

- 1. Attempt the following :**
- a) Define 'Wing loading' and explain its importance.
  - b) Distinguish between 'Range' and 'Endurance'.
  - c) Define 'Aerodynamic Center' & 'Center of Pressure'
  - d) Distinguish between 'Geometric' and 'Geo-potential' altitude.
  - e) Distinguish between 'Isothermal' and 'Gradient' regions.
  - f) Distinguish between 'Washin' and 'Washout'.
  - g) Distinguish between 'Chord line' and 'Camber line'.
  - h) Define 'Temperature altitude'.
  - i) Define 'Drag divergence Mach number' and explain its importance.
  - j) Define 'zero-lift' angle of attack.

## SECTION-B

2. Calculate the standard atmospheric values of  $T$ ,  $p$  and  $\rho$  at a geo-potential altitude of 18 km. Assume Lapse rate of  $-6.5$  K/km in the gradient region. (1,2,2)
3. Explain 'Delta Wing Aerodynamics' at Low Speed with the help of labeled illustration/plots. (5)
4. Derive the expression for lift coefficient and drag coefficient for minimum power condition. (5)
5. Define and explain various high lift devices. Show their effect on lift curve slopes. (5)
6. Derive the expression for take-off distance. (5)

## SECTION-C

7. Gulfstream-IV twin turbofan executive transport with weight of 200000N, planform area of  $80 \text{ m}^2$  and drag polar as  $C_D = 0.015 + 0.08C_L^2$  is flying at an altitude of 10 km ( $\rho = 0.413 \text{ kg/m}^3$ ). Calculate :
  - a)  $(C_L^{3/2}/C_D)_{\max}$ ,  $(C_L/C_D)_{\max}$  and  $(C_L^{1/2}/C_D)_{\max}$  values. (5)
  - b) Velocities at which  $(C_L^{3/2}/C_D)_{\max}$ ,  $(C_L/C_D)_{\max}$  and  $(C_L^{1/2}/C_D)_{\max}$  occur. (5)
8. Write notes on the following :
  - a) Drag and its categorization (5)
  - b) V/STOL vehicles (5)
9. Define 4-digit, 5-digit and 6-digit NACA series airfoils. What are laminar and supercritical airfoils? Where are these airfoils used? (6, 4)

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**