

Reg.No : .....

Name : .....

**Eighth Semester B.Tech Degree Examination, June 2017**  
**(2013 Scheme)**  
**13.805.2 Aerospace Engineering (MPU)**

Time:3 Hours

Max Marks: 100

PART-A

Answer all questions. Each question carries 2 marks

- 1, Derive a relationship between geopotential and geometric altitudes
- 2, Explain the variation of temperature in various regimes of earth's atmosphere
- 3, What is meant by aerodynamic centre?
- 4, Why coefficient of pressure is used for plotting the pressure distribution in an airfoil?
- 5, What are the various propeller coefficients?
- 6, What is meant by absolute and service ceilings of an aircraft?
- 7, What is meant by circular velocity? Derive an expression for it.
- 8, What is meant by aerodynamic balancing of control surfaces of an airplane?
- 9, Explain the classification of wind tunnels.
- 10, What is meant by range and endurance of an aircraft?

(10X2=20)

PART-B

Answer one full question from each Module. Each question carries 20 marks

**Module-I**

- 11 a) What is meant by Standard atmosphere? Explain how the variation of pressure and density at different altitudes can be calculated. (10)

- b) Consider an airplane flying at an altitude where the pressure and temperature are 25.37 Kpa and 216.66 K, respectively. Calculate the pressure and density altitudes at which the airplane is flying. (10)

OR

- 12 a) Explain Prandl's lifting line theory? (5)
- b) Explain how the Prandl's lifting line theory can be used to calculate the aerodynamic characteristics of a finite wing (15)

### Module-II

- 13 a) Explain how Froude's momentum theory can be used to calculate the efficiency of a propeller? (10)
- b) Derive the general two-dimensional translational equations of motion of an airplane in accelerated flight. (10)

OR

- 14 a) Show that at the velocity for minimum power required the airplane is flying at the angle of attack that corresponds to a maximum  $C_l^{3/2}/C_d$ . (10)
- b) Derive the Breguet range equation for a propeller driven airplane (10)

### Module-III

- 15 a) Explain the working of vertical speed indicator of an aircraft. (10)
- b) What is meant by static and dynamic stability of an aircraft. (10)

OR

- 16 a) Explain the working of turn and bank indicator of an aircraft. (10)
- b) Explain the criteria for longitudinal, lateral and directional static stability of an aircraft. (10)

### Module-IV

- 17 a) Explain the working of an Indraft wind tunnel. (10)
- b) Explain the types of engines used for subsonic aircraft. (10)

OR

- 18 a) Derive the orbit equation. (10)

- b) A low subsonic wind tunnel has a diffuser of area ratio 9. At a test section velocity of 30m/s and a temperature of 330K, the diffuser is found to have a 90% efficiency. If the pressure at the inlet to the diffuser is  $1.195 \times 10^5 \text{N/m}^2$  calculate the head loss in the diffuser. (10)
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