

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Summer 2018 - 19 Examination**

**Semester: 6**  
**Subject Code: 03101352**  
**Subject Name: Aircraft Design**

**Date: 02/05/2019**  
**Time: 10:30am To 01:00pm**  
**Total Marks: 60**

**Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions (All are compulsory) (One mark each) (15)**

1. SFC (C) of a pure turbojet engine in cruise mode \_\_\_\_\_
2. Propeller specific fuel consumption for a Piston-Prop (Variable pitch) in loiter mode \_\_\_\_\_
3. The inverted V tail reduces \_\_\_\_\_ tendencies in the aircraft.
4. The maximum lift load factor equals \_\_\_\_\_ at level-flight stall speed.
5. Landing gear is made of \_\_\_\_\_ material.
6. State the moderate sweep angle for a vertical tail with airplanes flying at low and medium subsonic Mach numbers
7. What is arrested landing?
8. What is ramp weight of aircraft?
9. Define wing incidence angle.
10. Define Dynamic Stability of aircraft.
11. Identify the approach velocity of an aircraft from the following:  
a) 3.1 Vs      b) 1.3 Vs      c) 1.5 Vs      d) 0.8 Vs
12. Optimized wing loading for range can be given by:  
a)  $w/s = C_L/q$       b)  $\frac{w}{s} = \frac{q C_{Lmax}}{\sqrt{\left(\frac{\phi v}{g}\right)^2 + 1}}$       c)  $w/s = q C_L$       d) None of above
13. Predict among the following for an aircraft with high thrust to weight ratio:  
a) accelerate more quickly      b) large wing area  
c) consume less fuel      d) less takeoff weight
14. Effects of downwash:  
a) Reduces angle of attack  
b) Produces additional drag  
c) Effects the flow over the horizontal plane  
d) All the above
15. Higher Reynolds number results:  
a) Separation resistance      b) Separation enhancement  
c) Not related to separation phenomenon      d) None of the above

**Q.2 Answer the following questions. (Attempt any three) (15)**

- A) Explain different types of wing configurations based on its location? Which wing configuration you will prefer for wing in ground vehicle design?
- B) Define following terms:  
a) Wing loading  
b) Thrust loading  
c) Empty weight  
d) Gross weight
- C) Explain "design cycle" in detail.
- D) What is stalling velocity? Establish its relationship with wing loading.

**Q.3 A) Explain about different tail configurations. (Compulsory) (07)**

- B) Define sweep of the wing and explain about the choice of sweep for horizontal tail. (Optional) (08)

**OR**

- B) Consider a jet airplane with a prescribed  $S_{land}$  of 1600 m. Assume,  $C_{Lmax} = 2.8$  and  $\sigma = 0.8$ . (08)  
Compute the wing loading for optimized takeoff weight. (Optional)

**Q.4 A) What choices are available for the selection of power plant location on aircrafts? Differentiate each in terms of their merits and demerits. (Optional) (07)****OR**

- A) What are the different types of load acting on a wing? Explain in detail. (Optional) (07)  
B) Explain the working principle of Turbo-shaft engine with a diagram. (Compulsory) (08)