



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. Briefly Explain:- 13
- a) Aircraft Design Requirements.
 - b) Seven points of conceptual Design.
- OR**
2. a) Explain 'Design Cycle' in detail. 7
- b) Classify aircraft on the basis of its purpose. 6
3. a) What is drag polar? How it is useful in Aircraft Design? 7
- b) What is manufacturability? Give your views on "Design for manufacturability" concept? 6
- OR**
4. a) Discuss area rule. 7
- b) Sketch 6
- i) NACA 23012 Airfoil
 - ii) NACA 0012 airfoil
- Give detail about its geometry.
5. a) What kind of power plant you will use for your sea plene? What will be the best suitable location for that power plant? Justify your answer? 5
- b) Define the following terms. 8
- i) Wing loading.
 - ii) Thrust loading.
 - iii) Empty weight.
 - iv) Gross weight.

OR

6. Consider the Anti-submarine warfare (ASW) Jet aircraft having crew weight and payload weight 800 lb and 10000 lb respectively. Mach No. of aircraft is 0.6. The additional data are as follows. 14
- AR = 8, (L/D) max = 16
 Cruise SFC = 0.5 ltr/hr
 Loiter SFC = 0.4 ltr/hr

Constants $A = 0.93$, $C = -0.07$, $K_{vs} = 1$

Segment weight fractions.

- i) Warmup and take off $f = 0.97$
- ii) Climb = 0.985
- iii) Land = 0.995

The mission profile of aircraft includes following segments.

- i) Warmup and take – off
- ii) Climb
- iii) Cruise of Range 1500 Nm
- iv) Loiter of 3 Hours duration.
- v) Cruise of range 1500 Nm.
- vi) Loiter of 20 mins
- vii) Land.

Using the above data, find fuel weight fraction, empty weight fraction, Also find total gross weight of the aircraft using at least five iterations.

7. a) Explain different types of wing configurations based on its location? Which wing configuration you will prefer for wing in ground vehicle design? 7
- b) What are the important factors taken into consideration for wing design? Explain in brief. 7

OR

8. a) Explain v-n diagram? 8
- b) Differentiate elliptical wing and rectangle wing by stating its advantages and disadvantages. 6

9. a) What are the different types of tail plan configurations used in aircraft? Explain with neat sketches. 13

OR

10. With neat sketch explain different types of fuselage structure. With their parts. 13

11. a) Explain various parts of landing gear with neat sketch. 7
- b) What are the design considerations for landing gear? 6

OR

12. What are different types of landing gear arrangements? Explain. 13
