PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2022 - 23 Examination

Semester:7   Date: 03/10/2022
Subject Code:203101401   Time: 10:30 am to 01:00 pm
Subject Name: Aircraft Design   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) (Each of one mark)   **(15)**
1. The overall weight of aircraft includes…………………….
2. Unit for specific fuel consumption is ……………….
3. For the jet airplanes unit for specific fuel consumption is ……………
4. Pitch is defined as…………….
5. A small business jet has internal diameter of 32in. The external diameter of passenger compartment is………………...
6. Flight path angle (γ) of a fixed wing aircraft during coordinated turn will be?
7. During a maneuver, lift is 5 times the weight of the aircraft. If the trim velocity at cruise was 80 m/s, what will the velocity (in m/s) during this maneuver?
8. Write the formula for Lift in steady level flight?
9. What will happen to density and temperature if height increases during flight?
10. Write the formula for Drag in steady level flight?
11. Aircraft can be classified based on?
   a) Total weight   b) None of these
   c) Size of the Aircraft   d) All of these
12. During a flight due to passenger's movement the center-of-gravity of aircraft moves away from neutral point, due to this the elevator angle required to trim the aircraft will?
   a) Increases   b) Same
   c) Decreases   d) First increase then decrease
13. The primary control used for bank angle control of aircraft is?
   a) Aileron   b) Rudder
   c) Elevator   d) Throttle
14. The primary control used for angle-of-attack control of aircraft is
   a) Elevator   b) Rudder
   c) Aileron   d) Throttle
15. Aircraft longitudinal stability depends upon?
   a) Types of winglets used   b) Control surface area
   c) Tail moment arm   d) All of the above

Q.2 Answer the following questions. (Attempt any three)   **(15)**
   A) Draw and explain Mission profile for Fighter and commercial aircraft separately.
   B) Define the Following

a) Wing loading	b) Thrust loading	c) Rudder	d) Pitot tube	e) Stalling Velocity

   C) Write the name of different types of tail configurations used in aircraft. Also explain any one of them?
   D) Write the advantages and disadvantages of Tricycle type of Landing gear?

Q.3 A) An airplane has a weight of 180,000 N at the beginning of the flight and 20% of this is the weight **(07)** of the fuel. In a flight at a speed of 800 km/h, the lift to drag ratio (L/D) is 12 and the TSFC of the engine is 0.8. Obtain rough estimates of the range in km and endurance in hr.

B) Write the advantages and disadvantages of primary and secondary control of aircraft? **(08)**

OR

B) What are the different types of propulsion system used in aircraft. Briefly explain any one of them? **(08)**

Q.4 A) Write down the formula used in Mission profile **(07)**
a) Warm up and take off
b) Climb
c) Cruise
d) Loiter
e) Land
f) Fuel weight fraction
g) Empty weight fraction

OR

A) Draw a neat sketch of Aircraft mentioning all the components of following **(07)**
a) Wing
b) Fuselage
c) Tail
d) Empennage
d) Cockpit

B) An aircraft is equipped with symmetrical aerofoil. For complete aircraft the lift curve slope is **(08)** 5/rad. Stall angle is 12 deg, wing area is 10 m^2. What is mass during flight, whereas stall speed is observed 90 Km/hr. g=9.8m/s^2, density of air is 1.225kg/m^3.