

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BACHELOR OF ENGINEERING – SEMESTER 7 – EXAMINATION – SUMMER 2026**

**Subject Code: 3170101**

**Date: 01/06/2026**

**Subject Name: Aircraft Design**

**Time: 02:30 PM TO 05:00 PM**

**Total Marks: 70**

**Instructions:**

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

- Q.1**
- (a)** Define the terms Payload, Cruise Speed and Maximum Speed **03**
  - (b)** Explain the importance of take-off and landing distance in aircraft design **04**
  - (c)** Describe how fuel fraction is determined during the conceptual design phase of an aircraft. **07**
- Q.2**
- (a)** Explain the effect of wing loading on takeoff, landing and climb. **03**
  - (b)** Discuss how airfoil selection and wing geometry influence aircraft performance. **04**
  - (c)** Explain tail geometry and fuselage volume considerations during aircraft design. **07**
- OR**
- Q.2**
- (c)** Discuss the effects of taper ratio and aspect ratio on flight performance of an aircraft. **07**
- Q.3**
- (a)** Draw the side view of the undercarriage geometry of a tail wheel aircraft. **03**
  - (b)** Explain the Conic Lofting procedure used in aircraft fuselage design. **04**
  - (c)** Explain the significance of different fuselage shapes using a neat sketch. **07**
- OR**
- Q.3**
- (a)** Explain the Circle-to-Square adapter used in the lofting procedure during aircraft fuselage design. **03**
  - (b)** Explain the fuselage loft verification process briefly. **04**
  - (c)** Which considerations will you take to select a tail plane configuration? **07**
- Q.4**
- (a)** What is the function of a winglet? **03**
  - (b)** Explain the flight envelope of a fighter aircraft. **04**
  - (c)** How will you estimate drag for your required fuselage design? **07**
- OR**
- Q.4**
- (a)** Explain the procedure to select an engine and determine the Thrust-to-Weight (T/W) ratio for an aircraft. **03**
  - (b)** Discuss the relationship between fuel quantity and range of an aircraft. **04**
  - (c)** Discuss various types of wing layouts and their necessity. **07**
- Q.5**
- (a)** List any three types of landing gear arrangements commonly used in aircraft. **03**
  - (b)** Given a landing gear with a castoring nose wheel, analyze how this affects ground handling and steering. **04**

- (c) Describe the various jet VTOL and propeller VTOL configurations used in aircraft design. **07**

OR

- Q.5** (a) Explain the purpose of a shock absorber in an aircraft landing gear system. **03**
- (b) Discuss the main subsystems associated with aircraft landing gear and their functions. **04**
- (c) Discuss aerodynamic considerations during the aircraft design procedure with an appropriate figure. **07**

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