Enrolment No./Seat No_____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2024**

**Subject Code: 3170101 Date: 24-05-2024**

**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.**

| | | | MARKS |
|---|---|---|---|
| **Q.1*** | **(a)** | List the steps involved in the weight estimation process of a flight vehicle. | **03** |
| | **(b)** | Summarize the relationship between the weight of a flight vehicle and its performance characteristics. | **04** |
| | **(c)** | How would you apply the standard weight estimation methods to a new conceptual design of a UAV (Unmanned Aerial Vehicle)? | **07** |
| **Q.2** | **(a)** | What is wing loading, and how is it calculated? | **03** |
| | **(b)** | List the major components of an aircraft's wing and fuselage. | **04** |
| | **(c)** | Describe the relationship between thrust-to-weight ratio and an aircraft’s takeoff and climb capabilities. | **07** |
| | | **OR** | |
| | **(c)** | Utilize lofting techniques to develop wing profiles suitable for different flight conditions. | **07** |
| **Q.3** | **(a)** | Define the thrust-to-weight ratio in the context of aircraft design. | **03** |
| | **(b)** | What are some specific factors that influence the configuration layout of military aircraft? | **04** |
| | **(c)** | Evaluate different tail plane designs for a cargo aircraft to determine which provides the best stability during different flight phases. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | What does initial sizing in aircraft design involve? | **03** |
| | **(b)** | List the factors that influence the initial sizing of an aircraft. | **04** |
| | **(c)** | Develop a comprehensive model for the initial sizing and tail plane sizing that can be adapted for various aircraft types, including UAVs and commercial jets. | **07** |
| **Q.4** | **(a)** | What are the primary functions of a fuel system in an aircraft? | **03** |
| | **(b)** | Summarize the role of the fuel system in delivering fuel to the engines and managing fuel consumption. | **04** |
| | **(c)** | Apply the principles of propulsion to design a propulsion system for a high-speed military aircraft. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | What are the primary functions of landing gear on an aircraft? | **03** |
| | **(b)** | What are the different types of landing gear configurations commonly used in aircraft design? | **04** |
| | **(c)** | Design a crew station layout for a next-generation fighter aircraft, considering factors such as display placement, control accessibility, and cockpit visibility. | **07** |

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| **Q.5** | **(a)** | What is VTOL? | **03** |
| | **(b)** | Shortly explain conic lofting. | **04** |
| | **(c)** | Develop a plan for integrating a retractable landing gear system into an existing aircraft design. | **07** |

**OR**

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|---|---|---|---|
| **Q.5** | **(a)** | Discuss gun installation. | **03** |
| | **(b)** | Explain Prop VTOL. | **04** |
| | **(c)** | Write a note on Statistical group weight method. | **07** |

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