

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2022****Subject Code:2170101****Date:01/06/2022****Subject Name:Aircraft Design- I****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 Maximum Takeoff weight (MTOW), Range, Endurance. **03**
- (b) Define- Payload, Reserved fuel, Non Expandable Payload, Maximum Zero Fuel Weight **04**
- (c) How does cruise speed affects range and endurance? What is loiter? **07**
- Q.2**
- (a) What is relation between fuel fraction and loiter time? **03**
- (b) Differentiate between expandable and non expandable payloads. **04**
- (c) With block diagram explain design methodology for Twin Turbo Prop aircraft. **07**
- OR**
- (c) Draw flight envelope and discuss various phases from engine start up to engine shut down. **07**
- Q.3**
- (a) What is wet area? What is role of wet area in aircraft design? **03**
- (b) Shortly explain volume determination of any one type of fuselage. **04**
- (c) Briefly explain various considerations to determine ratio which represent weight of airplane to the specific wing area. **07**
- OR**
- Q.3**
- (a) Discuss considerations for selection of T tail and H Tail. **03**
- (b) Discuss effect of thrust on take off and climb. **04**
- (c) What do you understand by  $T_{max}/W_0$ ? How will you determine in case of single engine jet aircraft? **07**
- Q.4**
- (a) Why do heavy jet transport aircrafts not able to climb directly at designed service ceiling while they have taken off with MTOW? **03**
- (b) Explain how Lift/drag ratio affects descend performance. **04**
- (c) How will you determine size of Vertical fin? How tail plan form area is affected by tail moment arm? **07**
- OR**
- Q.4**
- (a) How will you select type of propulsion system? **03**
- (b) How will you select airfoil of wing of a jet transport aircraft for transonic design mach number? **04**
- (c) Discuss loads on structural components of wing. **07**
- Q.5**
- (a) Explain the method which can give approximate weights of individual primary structural components of aircrafts. **03**
- (b) How will you find location of engines for prop driven aircrafts? **04**
- (c) What are stability governing parameters for fix wing aircrafts? **07**
- OR**
- Q.5**
- (a) Explain collective controls of helicopters. **03**
- (b) Explain cyclic controls of helicopters. **04**
- (c) Discuss tandem rotor and contra rotor configurations with neat sketch. **07**

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