

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VII(NEW) EXAMINATION – SUMMER 2019****Subject Code:2170101****Date:10/05/2019****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. Use drawing instruments for sketches.

**MARKS**

- Q.1** (a) What is the reason behind selection of Supercritical airfoils for jet transport aircraft? **03**
- (b) Enlist type of aircrafts with respect to their applications. Shortly explain their application in one sentence. **04**
- (c) With block diagram explain aircraft development process. **07**
- Q.2** (a) What is the reason for choosing laminar supercritical airfoils rather than supersonic airfoil for supersonic jet transport aircrafts? **03**
- (b) Discuss factors affecting cruise range of aircraft. **04**
- (c) How will you determine maximum takeoff weight for a supersonic jet fighter aircraft carrying expandable payload? **07**
- OR**
- (c) How will you determine wing loading of a conventional non aerobatic civil aircraft? **07**
- Q.3** (a) What are disadvantages of using Y tail? **03**
- (b) Draw and explain graph showing selection of engine with respect to mach number. **04**
- (c) How will you determine size of horizontal stabilizer and Vertical fin of T-Tail configuration? **07**
- OR**
- Q.3** (a) What is the reason for not choosing high bypass turbofan engines in spite of low thrust specific fuel consumption for supersonic aircrafts? **03**
- (b) How does wing loading affect take off and landing performance? **04**
- (c) Discuss factors affecting static and dynamic stability of aircraft? **07**
- Q.4** (a) Define Centre of pressure, Aerodynamic centre, C.G. Range. **03**
- (b) Differentiate between expandable and non expandable payloads. **04**
- (c) How will you choose type of airfoils for various applications of main wing? **07**
- OR**
- Q.4** (a) Define Static margin, Neutral Point, Mean Aerodynamic Chord. **03**
- (b) How will you determine fuel weight of any piston prop aircraft? **04**

- (c) How will you choose location of high by pass Jet engines in case of 2, 3 and 4 units? Discuss with respect to ground clearance, Thrust-Drag couple. **07**
- Q.5** (a) Only draw a conventional rotary wing aircraft with nomenclature. **03**
- (b) Discuss aerodynamic and structural design of main rotor. What are major differences between geometry of propellers and main rotors? **04**
- (c) Discuss control system of contra rotor and tandem rotor configurations of helicopters with neat sketch. **07**

**OR**

- Q.5** (a) What are reasons for cambered airfoil on vertical fin and horizontal stabilizer of conventional helicopters? **03**
- (b) What are major differences between main rotor and tail rotor swash plates? **04**
- (c) Explain mechanism and operation of swash plate of main rotor. **07**

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