Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–8• EXAMINATION – SUMMER 2015**

**Subject Code: 180101** **Date:13/05/2015**

**Subject Name: Aircraft Design-II**

**Time: 10:30 to 01:30** **Total Marks: 70**

**Instructions:**

1. **Wherever necessary.**
2. **Figures to the right indicate full marks.**
3. **Attempt all questions.**
4. ***Make suitable assumptions. Attain Q-1 and Q-2 (a) in extra sheet of graph or drawing paper provided to you. Do not mention dimensions.***

| | | | |
|---|---|---|---|
| **Q.1** | **(a)** | Prepare layout of Tandem seated, twin engine, Deep Penetration Strike Aircraft. MTOW= 43670lbs,$L_{Fuselage}$=60 feet. $W_O/S_W$= 94 lbs/ft$^2$,$M_{max}$= 2.2 Mach, Net wing span= 32 feet.$C_r$= 16 feet, $C_t$= 6.5 Feet. Leading Edge Sweep= 45$^\circ$, Maximum Fuselage width=12 feet. Mention all control surfaces on wings. Mention Strake. Apply supersonic area rule.Take scale of 1cm= 1 feet. | **07** |
| | **(b)** | Thistandem seater fighter aircraft is equipped with two Low Bypass Turbo Fan Engines. $T_{MAX}/W_O$= 1.06.$\varnothing_{Engine}$=3 feet, $L_{Engine}$ = 10.5 Feet. Length of after burner pipe= 2.5 feet. Locate both engines in above mention geometry.Consider jet blast area 21$^\circ$ either side from nozzle. | **07** |
| **Q.2** | **(a)** | In above mention design for higher longitudinal stability, attachstabilators on empennage.Available tail moment arm $L_{HT}$= 16.5 feet. Net stabilators span= 14 feet. $C_r$=10 feet, $C_t$= 4 Feet. Leading Edge Sweep= 45$^\circ$.Mention axis of rotation of stabilators. | **07** |
| | **(b)** | Define "Lofting". How lofting is useful to develop aerodynamic shapes of aircrafts. | **07** |
| | | **OR** | |
| | **(b)** | Explain fuel system integration in fighter or aerobatic aircraft. | **07** |
| **Q.3** | **(a)** | With neat sketch explain flight envelope of a commercial jet transport aircraft. | **07** |
| | **(b)** | Briefly explain how $T_{max}/W_O$and $W_O/S_W$ works upon take-off, Dog fight, aerobatics and landing performance? | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | With neat sketch explain flight envelope of a military fighter aircraft. | **07** |
| | **(b)** | With neat sketch explain geometry of a cockpit of fighter jets. | **07** |
| **Q.4** | **(a)** | Explain importance of different types of Canard in aircraft design. Write down procedure to design control canard. | **07** |
| | **(b)** | Explain aerodynamic considerations in designing supersonic aircrafts. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | How sweep back angle and thickness/chord ratio is decided in high subsonic and supersonic aircrafts? | **07** |
| **Q.4** | **(b)** | Explain procedure to find fuel fraction estimation ($W_f/W_o$) in civil aircraft flight envelope. | **07** |
| **Q.5** | **(a)** | With neat sketches explain different types of landing gear location and retraction geometry in conventional transport aircrafts. | **07** |
| | **(b)** | With neat sketch explain circle-square adopter method to prepare | **07** |

fuselage and inlets lofting.

**OR**

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | Differentiate flight performance of aircrafts having expandable and non-expandable pay loads. | **07** |
| | **(b)** | Explain considerations to design passenger compartment that passengers feel comfortable in general aviation transport aircraft. | **07** |

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