

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VII (New) EXAMINATION – WINTER 2019****Subject Code: 2170101****Date: 23/11/2019****Subject Name: Aircraft Design I****Time: 10:30 AM TO 01:00 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 to make figures.

MARKS

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|------------|-----|---|-----------|
| Q.1 | (a) | Discuss three phases of aircraft design process in one sentence. | 03 |
| | (b) | Define Basic empty weight, expandable payload, reserve fuel, maximum zero fuel weight. | 04 |
| | (c) | Shortly explain different phases of flight of a conventional ground attack aircraft. | 07 |
| Q.2 | (a) | Define all parameters required to start aircraft design. | 03 |
| | (b) | Discuss various types of wing layout and their necessity. | 04 |
| | (c) | Explain aircraft development process with block diagram. | 07 |
| OR | | | |
| | (c) | How will you determine fuel fraction for weight estimation. | 07 |
| Q.3 | (a) | How will you determine Maximum Takeoff Weight after determining Fuel weight? | 03 |
| | (b) | Explain effect of thrust to weight ratio on climb performance. | 04 |
| | (c) | Explain effect of wing loading on takeoff performance in various temperature and density conditions. | 07 |
| OR | | | |
| Q.3 | (a) | Which aerodynamic considerations are required to design a supersonic public transport aircraft? | 03 |
| | (b) | Explain advantages and disadvantages of H-tail and V-Tail configurations with neat sketch. | 04 |
| | (c) | Classify types of drag explain each of one in one sentence. | 07 |
| Q.4 | (a) | How will you determine area of horizontal stabilizer of a jet transport aircraft? Explain with neat sketch. | 03 |
| | (b) | Which considerations should be taken to choose airfoil section of a horizontal stabilizer? | 04 |
| | (c) | How will you decide plan form shape of horizontal tail plane for different applications and airspeeds? | 07 |
| OR | | | |
| Q.4 | (a) | How will you determine area of vertical fin of a supersonic jet fighter aircraft? | 03 |
| | (b) | Discuss considerations to place horizontal stabilizer and set a proper tail moment arm. | 04 |
| | (c) | How will you select type of aircraft engine for particular design? | 07 |
| Q.5 | (a) | Only draw suitable locations for placements of aircraft engines | 03 |

- (b) Explain principle of construction for airframe with examples **04**
(c) What are the considerations to select material for particular components? **07**

OR

- Q.5** (a) Discuss any one type of main rotor configuration with respect to maneuvering controls. **03**
(b) What is refined weight estimation method? **04**
(c) Explain function of cyclic and collective pitch control. **07**

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