Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V EXAMINATION – SUMMER 2025

Subject Code:3150101 Date:15-05-2025

Subject Name:Flight Mechanics

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)**	Define Altitude and write a hydrostatic equation.	**03**
	(b)	How aircraft steady level flight maintain? Explain	**04**
	(c)	1. What is the difference between static and dynamic stability in aircraft? 2. What role does the horizontal stabilizer play in pitch control? 3. How does the elevator contribute to longitudinal control during a climb?	**07**
Q.2	**(a)**	What is Pull up?	**03**
	(b)	1. How do control surfaces affect an aircraft's maneuverability during flight? 2. What is the effect of adverse yaw and how is it counteracted during turns?	**04**
	(c)	Explain how the drag polar of an aircraft affects its performance in steady level flight. What happens when the drag coefficient changes due to flap extension?	**07**
		OR	
	(c)	Design an experiment to test the effect of altitude on the performance of an aircraft during steady flight. What variables would you measure and how would you ensure accurate results?	**07**
Q.3	**(a)**	1. How does thrust-to-weight ratio influence an aircraft's ability to accelerate? 2. How does bank angle affect the stall speed in accelerated flight?	**03**
	(b)	Explain Time to Climb.	**04**
	(c)	Discuss the various factors that influence the take-off distance of an aircraft, including aircraft weight, runway conditions, wind, and altitude.	**07**
		OR	
Q.3	**(a)**	How does increasing the angle of attack affect drag during acceleration?	**03**
	(b)	What is the purpose of V-N diagram?	**04**
	(c)	Evaluate the operational limits of C.G. travel for a given aircraft design.	**07**
Q.4	**(a)**	Define Angle of Attack.	**03**
	(b)	Explain stability in shortly.	**04**
	(c)	Propose a method to modify the aircraft's control system to reduce the stick force gradient during pull-up maneuvers while maintaining stability. How would these changes affect the overall flight envelope and C.G. limits?	**07**
		OR	
Q.4	**(a)**	Define Centre of Gravity.	**03**
	(b)	What is the working principle of Horizontal Stabilizer?	**04**
	(c)	Analyze the relationship between lateral stability and wing dihedral. How does increasing the dihedral angle affect an aircraft's ability to recover from a roll disturbance?	**07**

Q.5	**(a)**	Draw a Thrust required curve.	**03**
	(b)	Shortly explain absolute ceiling.	**04**
	(c)	Given an aircraft experiencing a yaw moment due to engine failure on one side, how would you use directional control to maintain a straight flight path? Describe the control inputs required.	**07**

OR

Q.5	**(a)**	Write an equation of geopotential and geometric altitudes.	**03**
	(b)	Draw a curve comparison of lift – induced and zero –lift thrust required.	**04**
	(c)	Describe the role of the vertical stabilizer in maintaining an aircraft's directional stability. How does it respond to a yaw disturbance?	**07**

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