Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(NEW) EXAMINATION – SUMMER 2022

Subject Code:3150101 Date:04/06/2022

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: Geometric Altitude, Absolute Altitude & Geopotential Altitude	**03**
	(b)	Explain flight in a power-off glide. (Gliding flight)	**04**
	(c)	What is ISA? Why it is needed?	**07**
Q.2	**(a)**	Define: Range, Endurance, Load Factor	**03**
	(b)	With neat sketches explain effect of Altitude on Power available and Power required.	**04**
	(c)	Derive expressions for Range and Endurance for Jet Airplane.	**07**
		OR	
	(c)	Consider an airplane with following characteristics: Weight= 38,220 N Wing area= 27.3 m^2 Aspect ratio= 7.5 e= 0.9 $C_{D,0}$=0.03. $Density_{4.5\ km}$=0.777 kg/m^3 Calculate the thrust required to fly at a velocity of 350 km/hr at 1. Standard sea level 2. An altitude of 4.5 km	**07**
Q.3	**(a)**	Why during hot summer days an airplane requires a longer take-off distance compared to cooled winter days?	**03**
	(b)	With neat sketch explain V-n Diagram.	**04**
	(c)	Derive an expression to calculate Landing distance.	**07**
		OR	
Q.3	**(a)**	What is Static margin? Explain.	**03**
	(b)	Explain Stick Force gradient.	**04**
	(c)	Explain the role of Wing sweep in Directional stability.	**07**
Q.4	**(a)**	Define: Static Stability & Dynamic Stability.	**03**
	(b)	What do you mean by Stable, Unstable and Neutral equilibrium?	**04**
	(c)	Derive equations for turn radius and turn rate for steady coordinated level turn, Pull-up turn and Pull down turn.	**07**
		OR	
Q.4	**(a)**	What is Adverse Yaw?	**03**
	(b)	Explain Dihedral effect.	**04**
	(c)	What is Elevator Hinge moment? Explain how it varies with angle of attack and elevator deflection.	**07**

Q.5	**(a)**	Contrast Stick free and Stick fixed stability.	**03**
	(b)	What is Neutral Point? Explain in detail.	**04**
	(c)	With neat sketch explain necessary criteria for longitudinal static stability.	**07**

OR

Q.5	**(a)**	With neat sketch list down criteria for Lateral stability.	**03**
	(b)	Derive an expression to calculate elevator angle to trim the airplane (δ_{trim}).	**04**
	(c)	Explain the role of elevator in static longitudinal control.	**07**

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