

# GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – SUMMER 2019

**Subject Code: 2150101**

**Date: 06/06/2019**

**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.

		MARKS
Q.1	(a) Define: Lift Coefficient, Drag Coefficient & Moment Coefficient.	03
	(b) Show comparison of $C_L$ - $\alpha$ curve for Symmetrical and Cambered airfoils.	04
	(c) Write a note on the Standard atmosphere.	07
Q.2	(a) Differentiate between Infinite and Finite Wings.	03
	(b) Define Pressure Coefficient. Can Prandtl-Glauert is applicable to $M_\infty = 1$ ? Explain.	04
	(c) Define Critical Mach Number. Explain how does airfoil thickness affects critical Mach number and Critical pressure coefficient?	07
<b>OR</b>		
Q.3	(c) Explain Drag Divergence Mach number in detail.	07
	(a) Explain different types of Drag.	03
	(b) Write a note on Swept back wings.	04
	(c) Derive an equation to calculate Thrust required for steady level unaccelerated flight. Also derive condition for minimum Thrust requirement.	07
Q.3	(a) Explain Downwash.	03
	(b) Write a note on Gliding flight.	04
	(c) With a neat sketch explain V-n diagram.	07
Q.4	(a) Define: Wing Loading, Range & Endurance.	03
	(b) Define Absolute and Service Ceilings.	04
	(c) Estimate lift-off distance for the CJ-1 (data given below) at sea level. Assume $\mu_r = 0.02$ . During the ground roll, the angle of attack of the airplane is restricted by the requirement that the tail do not drag the ground. Assume that $C_{Lmax}$ during ground roll is limited to 1. When the airplane is on the ground, the wings are 1.83 m above the ground.	07
Q.4	(a) Explain Ground effect in terms of Induced drag.	03
	(b) Derive formula to calculate Endurance for propeller driven airplane.	04
	(c) Derive an equation to estimate Landing distance.	07
Q.5	(a) Define Static and Dynamic Stability.	03
	(b) Why Horizontal Stabilizer is required? Explain in terms of Longitudinal stability.	04
	(c) Explain necessary criteria for longitudinal static stability.	07
Q.5	(a) Explain Stick fixed Stability and Stick free Stability.	03
	(b) Write a note on Directional Static Stability.	04

(c) Write a note on:

1. Neutral Point
2. Static Margin

**Data for the CJ-I:-**

**Wing Span: 16.25 m**

**Wing area: 29.54 m<sup>2</sup>**

**Normal gross weight: 88176.75 N**

**Power plant: Two turbofan engines of 16242.5 N thrust *each***

**$C_{D,0}=0.02$**

**$e=0.81$**

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