

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER– V (New) EXAMINATION – WINTER 2019****Subject Code: 2150101****Date: 25/11/2019****Subject Name: Flight Mechanics****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.

		<b>MARKS</b>	
<b>Q.1</b>	(a) Define: Pressure, Temperature and Density altitudes.	<b>03</b>	
	(b) Explain Attached flow and Separated flow with an example.	<b>04</b>	
	(c) Write a note on International Standard Atmosphere.	<b>07</b>	
<b>Q.2</b>	(a) Explain Prandtl-Glauert rule.	<b>03</b>	
	(b) Compare lift curves for symmetric and cambered airfoils with explanation.	<b>04</b>	
	(c) Explain Critical Mach number. Show the effect of airfoil thickness on critical Mach number.	<b>07</b>	
<b>OR</b>			
<b>Q.3</b>	(c) List down different types of drag. Explain wave drag in detail.	<b>07</b>	
	(a) Identify the performance of finite and infinite wings.	<b>03</b>	
	(b) Relate the zero-lift drag and induced drag for minimum thrust requirement condition.	<b>04</b>	
<b>Q.3</b>	(c) Derive expressions for Range and Endurance for jet airplane.	<b>07</b>	
	<b>OR</b>		
	(a) Define: Range, Endurance, Wing Loading	<b>03</b>	
<b>Q.4</b>	(b) Explain Absolute and Service Ceilings.	<b>04</b>	
	(c) Explain V-n diagram with neat sketch.	<b>07</b>	
	(a) Define: Aspect Ratio, Pressure Coefficient, Induced drag.	<b>03</b>	
<b>Q.4</b>	(b) Demonstrate the effect of altitude on power required and power available.	<b>04</b>	
	(c) Estimate the Landing ground roll distance at sea level for the aircraft having empty weight of 54966 kg. No thrust reversal is used; However, spoilers are operated such that $L=0$ . The maximum lift coefficient ( $C_{L \max}$ ) with fully flaps employed at touch down is 2.5. Wing area is $29.54 \text{ m}^2$ . $C_{D,0} = 0.022$ & $\mu_r = 0.4$ .	<b>07</b>	
	<b>OR</b>		
<b>Q.4</b>	(a) Derive Hydrostatic equation.	<b>03</b>	
	(b) Contrast Stick fixed stability and Stick free stability.	<b>04</b>	
	(c) Make use of Newton's 2 <sup>nd</sup> law to derive the equation of motion for level unaccelerated flight.	<b>07</b>	
<b>Q.5</b>	(a) Define and explain Elevator angle to trim the airplane to desired angle.	<b>03</b>	
	(b) Explain Static margin.	<b>04</b>	
	(c) Explain Longitudinal static stability in detail.	<b>07</b>	
<b>OR</b>			
<b>Q.5</b>	(a) Define Static Stability and Dynamic Stability.	<b>03</b>	
	(b) Define Neutral point. Show that it is a crucial parameter for longitudinal static stability.	<b>04</b>	
	(c) Classify different types of Flaps.	<b>07</b>	

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