

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.

	MARKS
Q.1 (a) Define: Pressure, Temperature and Density altitudes.	03
(b) Explain Attached flow and Separated flow with an example.	04
(c) Write a note on International Standard Atmosphere.	07
Q.2 (a) Explain Prandtl-Glauert rule.	03
(b) Compare lift curves for symmetric and cambered airfoils with explanation.	04
(c) Explain Critical Mach number. Show the effect of airfoil thickness on critical Mach number.	07
OR	
(c) List down different types of drag. Explain wave drag in detail.	07
Q.3 (a) Identify the performance of finite and infinite wings.	03
(b) Relate the zero-lift drag and induced drag for minimum thrust requirement condition.	04
(c) Derive expressions for Range and Endurance for jet airplane.	07
OR	
Q.3 (a) Define: Range, Endurance, Wing Loading	03
(b) Explain Absolute and Service Ceilings.	04
(c) Explain V-n diagram with neat sketch.	07
Q.4 (a) Define: Aspect Ratio, Pressure Coefficient, Induced drag.	03
(b) Demonstrate the effect of altitude on power required and power available.	04
(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 m^2 . $C_{D,0} = 0.022$ & $\mu_r = 0.4$.	07
OR	
Q.4 (a) Derive Hydrostatic equation.	03
(b) Contrast Stick fixed stability and Stick free stability.	04
(c) Make use of Newton's 2 nd law to derive the equation of motion for level unaccelerated flight.	07
Q.5 (a) Define and explain Elevator angle to trim the airplane to desired angle.	03
(b) Explain Static margin.	04
(c) Explain Longitudinal static stability in detail.	07
OR	
Q.5 (a) Define Static Stability and Dynamic Stability.	03
(b) Define Neutral point. Show that it is a crucial parameter for longitudinal static stability.	04
(c) Classify different types of Flaps.	07
