Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E SEM-V Examination-Nov/Dec.-2011

Subject code: 150101 **Date: 22/11/2011**

Subject Name: Flight Mechanics

Time: 02.30 pm-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.**

Q.1	**(a)**	Define and Explain critical Mach number, drag-divergence Mach number and super critical airfoil with the help of suitable diagrams.	**07**
	(b)	Explain role of $(C_l)_{max}$ on stalling velocity. Justify your answer with suitable mathematical derivation and diagram.	**07**
Q.2	**(a)**	Derive equation for maximum rate of climb for jet propelled airplane.	**07**
	(b)	Explain graphical approach with suitable example to calculate thrust required condition for steady , level flight	**07**
		OR	
	(b)	Explain in detail with neat and proper diagram any two of high lift techniques used to delay the flow separation over an airfoil.	**07**
Q.3	**(a)**	Derived the generalized equation of motion of an airplane. List the assumption and show the generalized steady state equation of motion of an airplane for performance evaluation	**07**
	(b)	Explain finite wing and infinite wing with the help of suitable diagram. List the various drag on each.	**07**
		OR	
Q.3	**(a)**	Explain v-n diagram in details with the suitable diagram. What information can be obtained from v-n diagram	**07**
	(b)	Explain 1. Interference drag, 2. Parasite drag, 3. Trim drag, 4. Zero-lift drag, 5. Drag due to lift, 6. Profile drag and 7. Transonic drag	**07**
Q.4	**(a)**	Derive expression for Range and Endurance for propeller driven aircraft	**07**
	(b)	Derive expression for maximum velocity for jet engine in steady state level flight	**07**
		OR	
Q.4	**(a)**	Derive and expression for Range and Endurance for jet engine driven aircraft	**07**
	(b)	Explain take off and landing performance of an airplane.	**07**
Q.5	**(a)**	Define 1. Stability and Control, 2. Static stability, 3. Dynamics Stability, 4. stick free static stability, 5. Stick fixed static stability, 6. Stick free longitudinal static stability, and 7. Stick fixed longitudinal static stability	**07**
	(b)	Derive equation of longitudinal static stability	**07**
		OR	
Q.5	**(a)**	Explain procedure using mathematical derivation to calculate and determine the free stream velocity using Pitot-Static probe in supersonic flow field.	**07**
	(b)	Explain drag polar in detail with schematic components of the drag polar	**07**

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