Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER 2013

Subject Code: 150101 **Date: 14-05-2013**

Subject Name: Flight Mechanics

Time: 10.30 am - 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.**

Q.1 **(a)** Derive equation shows relationship between temperature, pressure and density within altitude of 11km from the sea level. **07**

(b) What do you understand by compressibility correction and why it is necessary in measurements of airspeed? **07**

Q.2 **(a)** Define air speed indicator reading, indicated airspeed, calibrated airspeed, equivalent airspeed, true airspeed. Also show relationship between true airspeed and equivalent airspeed. **07**

(b) Explain relationship between airspeed and angle of attack. Also discuss the effect of airspeed on lift coefficient. **07**

OR

(b) Explain effect of weight on performance of airplane **07**

Q.3 **(a)** Explain the following **07**

1. Effects of flaps on trim
2. Disadvantages of flat glide angle

(b) A 747 is flying at 34000 ft pressure altitude. Temperature is 15 ºC above standard and the cruise Mach number is 0.85. Determine **07**

1. Equivalent airspeed
2. Total pressure at pitot tube
3. Calibrated airspeed
4. True airspeed

OR

Q.3 **(a)** Explain airplane manoeuvers with the help of suitable diagram. **07**

(b) Calculate the value of pressure, pressure ratio, density, density ratio and temperature for the standard atmosphere at an altitude of 8000m. the standard SL values are Pressure = 1atm, density = 1.2256 kg/m^3 , temperature 288 K and lapse rate = -0.0065 K/m **07**

Q.4 **(a)** What do you understand by stability and control of an airplane? **07**

(b) Show that C_L for maximum range for a jet airplane at constant altitude , æC_{DC} =0, is 1/ã3 times the C_L for $(L/D)_{max}$, the C_L for maximum range for a propeller driven airplane. **07**

OR

Q.4 **(a)** Show that tangent of gliding angle is directly dependent on L/D ratio **07**

(b) Show that the minimum turning radius at a given speed is obtained with high maximum lift coefficient and low wing loading and high **07**

Q.5 **(a)** Show that if an airplane is to glide as far as possible, the angle of attack during the glide must be such that L/D ratio is a maximum. **07**

(b) Define following terms used in dynamic longitudinal and dynamic lateral stability **07**

1. Simple subsidence
2. Divergence
3. Phugoid
4. Short period mode
5. Dutch roll
6. Spiral mode

OR

Q.5 **(a)** What is longitudinal dihedral and anhedral? **07**

(b) Explain role of Swept back wing in airplane and its effect on dihedral stability **07**

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