

--	--	--	--	--	--	--	--	--	--

**Sixth Semester B.E. Degree Examination, July/August 2022**  
**Aircraft Performance**

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO questions from each part.

**PART - A**

- 1 a. Calculate the temperature at 8500 meters above sea level. The temperature at sea level is 15°C. (10 Marks)  
b. Prove that an Airfoil has an Aerodynamic centre within it. (10 Marks)
- 2 a. Derive an expression for maximum velocity, in terms of thrust to weight ratio and wing loading. Show the  $V_{max}$  on a curve  $T$  vs  $V_{\infty}$  for a jet propelled aircraft. (10 Marks)  
b. An Aeroplane has a wing loading of 2400 N/m<sup>2</sup> and its drag equation is  $C_D = 0.016 + 0.055 C_L^2$ . Calculate its (L/D)<sub>max</sub>, the minimum drag speed and (L/D) ratio at a speed of 100 m/s EAS. (10 Marks)
- 3 a. For a gliding flight prove that :  
i) Glide angle is strictly the function of L/D ratio.  
ii) Glide velocity is a function of altitude and wing loading. (10 Marks)  
b. Define Hodograph and sketch a typical hodograph for climb performance at a given altitude. (05 Marks)  
c. Sketch the variation of maximum rate of climb with altitude, illustrating absolute and service ceilings. (05 Marks)
- 4 a. Derive an expression of (L/D) ratio, when airplane is flying at  $m$  multiple of the minimum drag speed. (10 Marks)  
b. Calculate the value of  $\left(\frac{C_L^{3/2}}{C_D}\right)_{max}$ ,  $\left(\frac{C_L^{1/2}}{C_D}\right)_{max}$  and the corresponding velocities. Use the a/p data as  $W = 88176.75$  N,  $S = 29.54$  m<sup>2</sup>,  $AR = 8.93$ ,  $C_{D0} = 0.02$ ,  $K = 0.08$ ,  $\rho_{\infty} = 1.225$  kg/m<sup>3</sup>. (10 Marks)

**PART - B**

- 5 a. Derive the range equation for a Jet Airplane and wrote the condition for maximum range. (10 Marks)  
b. Derive the endurance equation for a propeller Aircraft and give the condition for maximum endurance. (10 Marks)
- 6 a. Explain in detail about the calculation of distance while airborne to clear an obstacle. (10 Marks)  
b. With a neat sketch, explain Intermediate Segments of ground roll. (10 Marks)
- 7 a. What is Energy Height of an A/C? Explain with a proper expression and examples. (10 Marks)  
b. Derive an expression for specific excess power which required for accelerate along its flight path. (10 Marks)
- 8 a. Derive the equation connecting radius of turn during an inverted pull down maneuver and "g". (10 Marks)  
b. Draw a detailed V-n diagram. (10 Marks)

\*\*\*\*\*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.