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Eighth Semester B.E. Degree Examination, July/August 2021 Flight Vehicle Design

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1
 - a. Explain the phases of design of an aircraft with the help of a flow chart. (08 Marks)
 - b. Calculate near exact weight of an aircraft from a guess value for the following data: where W_e is the empty weight and W_o is the take off weight. (08 Marks)

$$\frac{W_e}{W_o} = 0.93W_o^{-0.07}; W_o = \frac{10,800}{1 - 0.314 - \frac{W_e}{W_o}}$$
- 2
 - a. Define thrust to weight ratio. Give the expression for $\frac{T}{W}$ for propeller and Jet airplanes. (06 Marks)
 - b. Derive an expression for wing loading effect on flight ceiling and glide rate. (10 Marks)
- 3
 - a. Explain in detail the steps involved in conic fuselage development by conic lofting technique. (08 Marks)
 - b. Show that for a straight, tapered wing, Mean Aerodynamic Chord (MAC) is $\bar{C} = \frac{2}{3}C_r \left(\frac{\lambda^2 + \lambda + 1}{\lambda + 1} \right)$, where λ is taper ratio and C_r is root chord. (08 Marks)
- 4
 - a. Give justification for the placement of tail stabilizers in a conventional tail for maximum stall and spin control. (08 Marks)
 - b. Write a typical spread-sheet for vertical tail stabilizer sizing. (08 Marks)
- 5
 - a. Explain the selection criteria of propulsion system of an aircraft. (08 Marks)
 - b. Explain installed thrust correction of an aircraft propulsion. (08 Marks)
- 6
 - a. Obtain an expression for take off ground roll distance and list the minimum take off parameters required for commercial aircraft. (08 Marks)
 - b. Briefly explain passive and active lift enhancement. (08 Marks)
- 7
 - a. Discuss on lateral stability criterion on aircraft design. (08 Marks)
 - b. Obtain control surface sizing for longitudinal control. (08 Marks)
- 8
 - a. What are the criteria for rudder area sizing to provide directional control? (08 Marks)
 - b. Explain Cooper-Harper rating scale. (08 Marks)
- 9
 - a. Explain the characteristics of fuel system of an aircraft. (08 Marks)
 - b. Explain the selection criteria of anti-icing and de-icing systems in an aircraft. (08 Marks)
- 10
 - a. Write short note on:
 - (i) Flight control systems (08 Marks)
 - (ii) Navigation systems. (08 Marks)
 - b. Explain the criteria for selection of materials of an aircraft. (08 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.