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10AE62

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
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. Calculate thrust required for level unaccelerated flight at 8000 ft high given that the aircraft weight is 75,000 lb, $\rho_\infty = 8.9 \times 10^{-4}$ slugs/ft³, $S = 950$ ft², $V = 500$ ft/sec, $C_{D0} = 0.015$ and $k = 0.08$. (10 Marks)
b. Calculate the minimum thrust required and the velocity at which it occurs for the data $W = 75,000$ lb, $S = 950$ ft², $\rho_\infty = 8.9 \times 10^{-4}$ slugs/ft³, $C_{D0} = 0.015$ and $k = 0.08$. (10 Marks)
- 3 a. Derive an equation for max rate of climb. (10 Marks)
b. What is absolute ceiling and service ceiling of a jet aircraft? (10 Marks)
- 4 a. Calculate L/D for an aircraft with weight 75,000 lb, $S = 950$ ft², $C_{D0} = 0.015$ and $k = 0.08$ flying level at 3000 ft high where $\rho_\infty = 8.9 \times 10^{-4}$ slugs/ft³ and the speed of the aircraft is 400 ft/sec. (10 Marks)
b. Draw and explain the trailing edge high lift devices used in modern passenger plane and select the best out of it. (10 Marks)

PART – B

- 5 a. Derive the range equation for a jet airplane and write 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. Derive an equation for the Ground Run distance to reach V_{T0} . (10 Marks)
b. Calculate the ground run distance for an aircraft at $V_{T0} = 20$ ft/sec to clear an obstacle of 50 ft high. (10 Marks)
- 7 a. What are the factors affecting the landing distance required for an airplane to land. (10 Marks)
b. Explain the “ground effect” on an airplane while landing. (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)

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Important Note: 1. On consolidating your answers, use appropriate units. 2. Answers without units will not be considered. 3. On consolidating your answers, use appropriate units. 4. Answers without units will not be considered. 5. On consolidating your answers, use appropriate units. 6. Answers without units will not be considered. 7. On consolidating your answers, use appropriate units. 8. Answers without units will not be considered. 9. On consolidating your answers, use appropriate units. 10. Answers without units will not be considered. 11. On consolidating your answers, use appropriate units. 12. Answers without units will not be considered. 13. On consolidating your answers, use appropriate units. 14. Answers without units will not be considered. 15. On consolidating your answers, use appropriate units. 16. Answers without units will not be considered. 17. On consolidating your answers, use appropriate units. 18. Answers without units will not be considered. 19. 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