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Third Semester B.E. Degree Examination, June/July 2024 Elements of Aeronautics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Briefly explain the airplane components and their functions with neat sketch. (10 Marks)
b. Sketch the typical wing and fuselage structures and explain briefly about the components and their functions. (10 Marks)

OR

- 2 a. Briefly explain the aircraft axis system and the aircraft motion with neat sketch. (10 Marks)
b. Bring out various the metallic and non-metallic materials used for aircraft application. (10 Marks)

Module-2

- 3 a. Derive an expression for the variation of temperature, pressure and density with respect to altitude in isothermal and thermal gradient layer in atmosphere. (10 Marks)
b. Calculate the standard atmosphere value of temperature pressure and density at a geopotential altitude of 14km.
[Take $T_{\text{sealevel}} = 216.6\text{K}$, $P_{\text{sealevel}} = 1.01 \times 10^5 \text{ N/m}^2$, $\rho_{\text{sealevel}} = 1.225\text{kg/m}^3$] (10 Marks)

OR

- 4 a. Derive an expression for Bernoulli's theorem from Newton's second law of motion and list out some of the applications. (10 Marks)
b. Sketch and explain the lift curve for symmetric and unsymmetrical airfoils. (10 Marks)

Module-3

- 5 a. Draw the p-v and t-s diagram for the Brayton cycle and explain the salient features of the graph. Also derive the expression for efficiency and explain its application to jet engine. (10 Marks)
b. With neat sketch, briefly explain the working principle of turbo jet engine. (10 Marks)

OR

- 6 a. Discuss about the turbofan engine and also explain the effect of latitude and airspeed on Thrust. (10 Marks)
b. Briefly describe about the turbo prop engine with neat diagram and explain its working principle. (10 Marks)

Module-4

- 7 a. Define stability and briefly explain the criteria for longitudinal static stability with neat sketch. (10 Marks)
b. Derive an expression for turn rate and radius of turn for a pull up, pull down and level turn manoeuvres. (10 Marks)

OR

- 8 a. Draw a plot between Thrust required and velocity and explain the condition for minimum thrust required and also explain the effect of altitude on thrust required curves. (10 Marks)
- b. Define gliding flight. Write an expression for gliding angle and bringout the condition for minimum gliding angle. (10 Marks)

Module-5

- 9 a. With neat sketch, describe the components and working principle of a typical aircraft Hydraulic system. (10 Marks)
- b. Explain about the fuel system of an aircraft and describe the types with simple sketch. (10 Marks)

OR

- 10 a. Discuss about the components and working principle of a typical aircraft pneumatic system. (10 Marks)
- b. With suitable diagram, explain the flight control system of an aircraft. (10 Marks)

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