

CBCS SCHEME

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18AE34

Third Semester B.E. Degree Examination, Aug./Sept. 2020 Elements of Aeronautics

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Standard Atmosphere tables can be allowed.

Module-1

- 1 a. Define the following :
 - i) Aeronautical engineering
 - ii) Aircraft
 - iii) Airplane
 - iv) Aerospace engineering
 - v) Aerodynes. (08 Marks)
- b. Describe the function of
 - i) winglet
 - ii) spoilers
 - iii) stabilizers
 - iv) cockpit. (04 Marks)
- c. List the description of several aspects of an aircraft configuration. (08 Marks)

OR

- 2 a. Explain with neat sketch Monoque, semimonoque and truss structure of aircraft. (10 Marks)
- b. Explain in details with application metallic and non-metallic materials used in aircraft. (10 Marks)

Module-2

- 3 a. At 12km in the standard atmosphere, the pressure, density and temperature are $1.9399 \times 10^4 \text{ N/m}^2$, $3.1194 \times 10^{-1} \text{ kg/m}^3$ and 216.66k, respectively. Using these values, calculate the standard atmospheric values of pressure, density and temperature at an altitude of 18km and 12km. $g_0 = 9.8 \text{ m/s}^2$ and $R = 287 \text{ J/kg K}$. (07 Marks)



Fig Q3(a)

- b. At what value of the geometric altitude is the difference $h-h_G$ equal to 2 percent of the geo-potential altitude, h ? (07 Marks)
- c. Describe aerofoil nomenclature. (06 Marks)

OR

- 4 a. Given the pressure is $P = 31,000 \text{ N/m}^2$, find the pressure altitude, from the standard atmosphere tables :
 - @ $h = 8000 \text{ Km}$ $P = 35580 \text{ N/m}^2$ (lower)
 - @ $h = 9000 \text{ Km}$ $P = 30730 \text{ N/m}^2$ (upper)(06 Marks)

- b. Consider an airplane flying with a velocity of 60m/s at a standard altitude of 3km. At a point on the wing, the airflow velocity is 70m/s. Calculate the pressure at this point. Assume incompressible flow. @3000m Altitude : $p_1 = 7.01 \times 10^4 \text{ N/m}^2$
 $\rho = 0.909 \text{ kg/m}^3$ (06 Marks)

c. Define:

- i) Centre of pressure
- ii) Aerodynamic centre
- iii) Aspect ratio
- iv) Mach number.

(08 Marks)

Module-3

- 5 a. Illustrate typical parts of a jet engine. (07 Marks)
 b. Explain Ramjet engine. (06 Marks)
 c. Consider a turbojet powered airplane flying @ a standard altitude of 30,000ft at a velocity 500mi/h. The turbojet engine itself has inlet and exit areas of 7ft^2 and 4.5ft^2 respectively. The velocity and pressure of the exhaust gas at the exits are 16000ft/s and 640lb/ft^2 , respectively. Calculate the thrust of the turbojet.
 @ 3000ft : $p_\infty = 8.9068 \times 10^{-4} \text{ slug/ft}^3$
 $p_\infty = 629.66 \text{ lb/ft}^2$ (07 Marks)

OR

- 6 a. Explain TS and PV diagram for ideal Brayton cycle. (08 Marks)
 b. Derive the fundamental thrust equation for jet propulsion. (12 Marks)

Module-4

- 7 a. Draw a neat diagram showing primary control surface, Airplane movement, Axes of Rotation and type of stability with respect to Aircraft. (10 Marks)
 b. Describe stability analysis. (10 Marks)

OR

- 8 a. Describe stall speed. (08 Marks)
 b. Explain correct and incorrect angles of bank with neat labeled diagram. (08 Marks)
 c. Explain power required curve for the CP -1 at sea level. (04 Marks)

Module-5

- 9 a. With neat diagram, explain hydraulic system for large aircraft. (10 Marks)
 b. Describe the sources of pneumatic power. (05 Marks)
 c. Explain the classification of fuel system with neat diagram. (05 Marks)

OR

- 10 a. Describe Basic 6 and Basic 7 Grouping of cockpit Display. (07 Marks)
 b. Draw a neat diagram showing the Antennas location in an aircraft. (08 Marks)
 c. Describe APU. (05 Marks)
