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 is 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 1.9 399 $\times 10^4$ N/m^2, 3.1194 $\times 10^{-1}$ 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. $g_0 = 9.8$m/s and R = 287 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 = 31,000N/m^2, find the pressure altitude, from the standard atmosphere tables :
@ h = 8000 Km P = 35580 N/m^2 (lower)
@ h = 9000 Km P = 30730 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 : $p_1 = 7.01 \times 10^4$ N/m^2
$\rho = 0.909$ 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 4.5 ft^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 : $\rho_\infty = 8.9068 \times 10^{-4}$ slug/ft^3
$p_\infty = 629.66$ 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)**

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