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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.TECH IV SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - AUGUST 2023

Regulation: UG20

FLIGHT MECHANICS

Time: 3 Hours

(AERONAUTICAL ENGINEERING)

Max Marks: 70

Answer ALL questions in Module I and II

Answer ONE out of two questions in Modules III, IV and V

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

1. (a) With the help of a diagram explain the mission profiles of civil and military aircrafts. Determine the relation for the measurement of equivalent airspeed. [BL: Understand| CO: 1|Marks: 7]
- (b) Write the expression for the relation between temperature and height in the standard atmosphere model and explain this with a neat sketch. [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Elucidate the total airplane drag and types, drag reduction methods. Discuss the effect of Mach number on lift and drag coefficient with relevant graphs. [BL: Understand| CO: 2|Marks: 7]
- (b) Discuss about minimum drag speed and minimum power speed. Describe their importance in aircraft performance studies. [BL: Understand| CO: 2|Marks: 7]

MODULE – III

3. (a) Explain about absolute ceiling, service ceiling and self ceiling for an airplane. How these ceilings are useful for study of the flight performance of an airplane? [BL: Understand| CO: 3|Marks: 7]
- (b) Write a note on military aircraft maneuver performance. Explain the equations of motion of an aircraft under maneuvering. [BL: Understand| CO: 3|Marks: 7]
4. (a) Outline the effect of minimum drag speed of flight path control with neat sketch and graph. [BL: Understand| CO: 4|Marks: 7]
- (b) Determine the high performance specific climb expression in terms of specific excess power. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Describe turning flight in horizontal plane. Draw a sketch and show all the forces involved in this condition. [BL: Understand| CO: 5|Marks: 7]
- (b) An airplane has the following characteristics: $V = 120$ kmph., EAS, $h = 10,000$ m, $W = 3,400$ kg, $W/S = 24$ kg/m², $L/D = 10$, $T_a = 6,200$ kg. It makes a 900 turn in 18 seconds maintaining altitude and incidence angle. Calculate the load factor, bank angle, radius of turn, and the thrust horsepower required (air density at 10000 m = 0.4135 kg/m³) [BL: Apply| CO: 5|Marks: 7]

6. (a) Illustrate the pull-up maneuvers with neat sketches and also explain the importance of V-n diagram. [BL: Understand| CO: 5|Marks: 7]
- (b) Develop the equations of motion of an aircraft undergoing lateral maneuver or level turn and derive an expression for radius of turn. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Show the effect of flight variables on the landing performance. Explain the landing performance measurement. [BL: Understand| CO: 6|Marks: 7]
- (b) Determine the ground run and airborne distances for the takeoff performance. Explain about each parameters and its importance. [BL: Apply| CO:6|Marks: 7]
8. (a) Enumerate the need of 'trip fuel' and 'the diversion fuel'? Discuss briefly the space available and space required for landing of an aircraft. [BL: Understand| CO: 6|Marks: 7]
- (b) Derive the ground run and airborne distances equations for the landing performance. Explain about each parameters and its importance. [BL: Apply| CO: 6|Marks: 7]

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