

CBCS SCHEME

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Eighth Semester B.E. Degree Examination, June/July 2023 Flight Vehicle Design

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Discuss in brief the aircraft design stages. (10 Marks)
b. Explain the following for new aircraft design :
(i) Take-off weight build up. (10 Marks)
(ii) Empty weight estimation. (10 Marks)

OR

- 2 a. Derive an expression for wing loading in terms of thrust to weight ratio for a climb gradient of value 'G' ; and show that regardless of wing loading the following is true.
$$\frac{T}{\omega} \geq G + 2 \sqrt{\frac{C_{do}}{\pi A_e}}$$
 (10 Marks)
b. What are the implications of wing loading $\left(\frac{W}{S}\right)$ value on an aircraft design, mainly
(i) Stall speed.
(ii) Climb.
(iii) Range.
(iv) Endurance. (10 Marks)

Module-2

- 3 a. What are the volume considerations while sizing fuselage? (10 Marks)
b. Discuss flat wrap lofting. (10 Marks)

OR

- 4 a. Explain horizontal and vertical tail sizing. (10 Marks)
b. List and discuss the special considerations in configuration layout. (10 Marks)

Module-3

- 5 a. Explain the propulsion selection criteria. (10 Marks)
b. Describe installed engine thrust correction. (10 Marks)

OR

- 6 a. Derive an expression for takeoff :
(i) Ground Roll. (10 Marks)
(ii) Transition. (10 Marks)
b. Discuss various lift enhancing devices. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. Define the following :
- (i) Longitudinal static stability.
 - (ii) Lateral static stability.
 - (iii) Directional static stability.
- b. Derive the expression for a wing contribution to static longitudinal stability.

(06 Marks)

(14 Marks)

OR

- 8 a. Discuss the Rudder sizing spread sheet. (08 Marks)
- b. What are flying qualities? Explain the Cooper Harper pilot rating scale. (12 Marks)

Module-5

- 9 Describe the following :
- (i) Flight control system.
 - (ii) Landing gear system.

(20 Marks)

OR

- 10 Write note on the following :
- (i) Air conditioning system.
 - (ii) Fuel system.

(20 Marks)
