

CBCS SCHEME

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15AE82

Eighth Semester B.E. Degree Examination, Jan./Feb. 2023 Flight Vehicle Design

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Consider a typical military bomber of $L/D = 16$, warm up and take off fuel fraction is 0.97 climb fuel fraction is 0.985, Cruise $R = 1500\text{Nm}$ or $R = 2778\text{km}$, $C = 0.5\text{hr}$, $V = 0.6\text{M}$ (some for both the cruise condition) 1st loiter $E = 3\text{hrs}$, $C = 0.4/\text{hr}$, 2nd loiter $E = 13\text{hrs}$, landing fuel fraction is 0.95. Estimate take off to landing fuel fraction W_f/W_o . From W_f/W_o calculate the value of W_o .

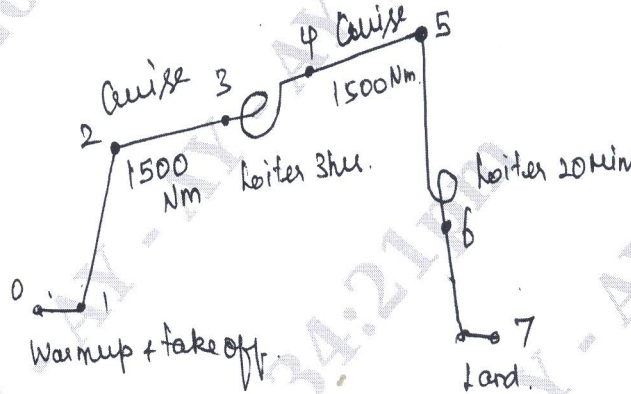


Fig Q1(a)

(12 Marks)

- b. Draw the flow chart for takeoff weight calculation neatly.

(04 Marks)

OR

- 2 Explain the effect of wing loading on stall speed, take off distance, Catapult take landing distance, cruise and loiter for Endurance.

(16 Marks)

Module-2

- 3 a. With neat sketch and equations explain the concept of wing/tail layout and loft. (10 Marks)
b. Write a brief note on structure considerations in configuration layout. (06 Marks)

OR

- 4 a. Write a short notes on wing and tail initial sizing with neat sketch. (08 Marks)
b. Draw a typical V – N diagram for an Aircraft and explain the important curves. Also draw the Gust envelop of the typical aircraft. (08 Marks)

Module-3

- 5 a. What are the different types of engines used in aircraft? Bring out the advantages and disadvantages of each. (08 Marks)
b. What is a flat rated engine? Explain. (08 Marks)

OR

- 6 a. What do you know about propeller propulsion system? (08 Marks)
b. What is active lift enhancement? Explain with neat sketches. (08 Marks)

Module-4

- 7 a. What is Longitudinal static stability and how do you enhance it? (08 Marks)
b. Define directional stability of an aircraft. How can it be increased? (08 Marks)

OR

- 8 a. Explain Cooper-Harper scale of pilot rating. (08 Marks)
b. What are environmental constraints faced by aircraft in its operation? (08 Marks)

Module-5

- 9 a. Explain the characteristics of fuel system of an aircraft. (08 Marks)
b. Explain the selection criteria of anti-icing and de-icing systems in an aircraft. (08 Marks)

OR

- 10 a. Write short notes on:
(i) Flight control systems
(ii) Navigation systems (08 Marks)
b. Briefly explain the selection criteria of materials to an aircraft. (08 Marks)
