

CBCS SCHEME

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18AE823

Eighth Semester B.E. Degree Examination, July/August 2022 Helicopter Dynamics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define the following : i) Disk loading ii) Blade loading co-efficient
iii) Power loading. (06 Marks)
- b. A helicopter has the following data :
Gross weight = 1363.6kg , Main rotor radius = 4 meters , Rotor top speed = 207.3 m/s ,
Rotor power = 205 kW. For hovering condition at sea level, compute the following :
i) Rotor disk loading ii) Ideal power loading iii) Thrust coefficient
iv) Figure of merit v) Actual power loading. (14 Marks)

OR

- 2 a. Explain Blade Flapping , Lead – lag and Coning of blades. (06 Marks)
- b. Derive Blade Element theory. (14 Marks)

Module-2

- 3 a. Derive an expression for Minimum Power Speed and Maximum Range Speed. (10 Marks)
- b. With a suitable sketch, explain the Swash Plate Mechanism. (10 Marks)

OR

- 4 a. Derive an equation for Induced Power co-efficient and Blade Profile Power co-efficient for helicopter in forward flight performance. (10 Marks)
- b. With suitable graph, briefly explain the effect of gross weight, density altitude and lift to drag ratios on helicopter performance. (10 Marks)

Module-3

- 5 a. What are the general requirements for a good Helicopter Rotor Airfoil? Also explain the stall limits for a typical rotating Airfoil. (10 Marks)
- b. Discuss the influence of Mach number and Reynolds number in Rotor Airfoil. (10 Marks)

OR

- 6 a. What are the Flow Visualization Techniques used to find Rotor Wakes? (10 Marks)
- b. What are the characteristics of Rotor Wake in forward flight? (10 Marks)

Module-4

- 7 a. Explain the longitudinal and directional stability aspects of Helicopter. (10 Marks)
- b. Describe the measure used in stability augmentation of Helicopter. (10 Marks)

OR

- 8 a. Briefly explain the Flight Test requirement of Helicopter. (10 Marks)
- b. What are the levels of handling Qualities? (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-5

- 9 a. Explain the structural strength and design requirement of Helicopter for operating on specified surfaces. (10 Marks)
b. What are the difference between Civil and Military derivatives of a Helicopter? (06 Marks)
c. What is the effect of Blade twist? (04 Marks)

OR

- 10 a. Briefly explain the overall design requirements of Helicopter. (10 Marks)
b. Describe the Empennage design parameters of Helicopter in detail. (10 Marks)

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