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15AE743

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022

Helicopter Dynamics

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Derive an expression for power required in axial climb and axial descent condition. (10 Marks)
b. Define the following : i) Disk loading ii) Blade loading coefficient iii) Power loading. (06 Marks)

OR

- 2 a. Explain the types of rotors of helicopters. (08 Marks)
b. Explain the condition of equilibrium about flapped hinge. (08 Marks)

Module-2

- 3 a. Explain briefly about the ground effects. (06 Marks)
b. Derive the speed for minimum power and speed for maximum range for forward flight performance in helicopters. (10 Marks)

OR

- 4 a. Explain the lateral and longitudinal asymmetry of lift of forward flight. (08 Marks)
b. Describe the working of Swash – Plaque system. (08 Marks)

Module-3

- 5 a. Explain in detail about the flow visualization technique. (08 Marks)
b. Explain briefly about the characteristics of rotor wake in hover condition. (08 Marks)

OR

- 6 a. Explain about the rotor Airfoil requirements. (06 Marks)
b. Explain the effects of the Reynold's number and mach number of rotor airfoil. (10 Marks)

Module-4

- 7 a. Explain the main rotor and tail rotor control. (08 Marks)
b. Briefly explain the general requirements of the flight and ground handling qualities. (08 Marks)

OR

- 8 Explain the following :
a. Forward speed disturbance
b. Vertical speed disturbance
c. Side slip speed disturbance
d. Lowing speed disturbance. (16 Marks)

Module-5

- 9 a. Explain the military derivatives of civil rotorcraft. (06 Marks)
b. Explain the classification of rotorcraft vibrations. (04 Marks)
c. Give the scope of requirements, general and operational requirements for a good helicopter. (06 Marks)

OR

- 10 a. Explain the effects of following characteristics on the design of motor rotors.
i) Rotor diameter ii) Rotor solidity iii) Tip speed. (10 Marks)
b. Explain briefly the designating of emphonage components. (06 Marks)
