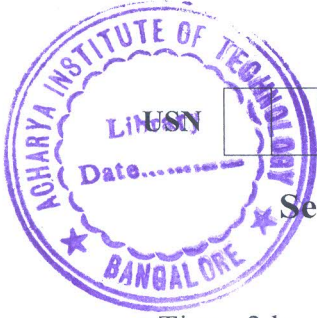


CBCS SCHEME



15AE743

Seventh Semester B.E. Degree Examination, Aug./Sept.2020 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. Give a brief note on rotor blade design and rotor configuration. (10 Marks)
b. Brief on following concepts:
(i) Power loading
(ii) Momentum theory of hovering flight
(iii) Disc loading (06 Marks)

OR

- 2 a. Explain the major components of helicopter mentioning their applications over fixed wing aircraft and write its advantages. (10 Marks)
b. With the help of neat diagram, briefly explain the function of tail rotor. (06 Marks)

Module-2

- 3 a. Mention forces acting on helicopter on forward flight and describe how translatory flight is achieved and its methods. (06 Marks)
b. Derive an expression for a relationship between the induced velocity and in the plane of the rotor and the velocity on the vena contracta. (10 Marks)

OR

- 4 a. What are the factors affecting forward speed and ground effects? Explain. (04 Marks)
b. Write short notes on:
(i) Total power required in forward flight performance
(ii) Speed for minimum power and maximum range
(iii) Effects of gross weight on flight performance (12 Marks)

Module-3

- 5 a. Explain possible dynamic behavior of typical helicopter with the help of suitable graphs. (08 Marks)
b. What are rotor airfoil requirements and how it affects Reynolds number and Mach number? (08 Marks)

OR

- 6 a. Describe flow visualization techniques used to measure rotor wakes and blade tip vortices. (12 Marks)
b. Mention characteristics of rotor wake in hover and forward flight. (04 Marks)

Module-4

- 7 a. What do you mean by dynamic stability? Explain briefly general requirements of flight and ground handling qualities. (07 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.

- b. Elaborate on following:
- (i) Vertical speed disturbance
 - (ii) Side-slip disturbance
 - (iii) Yawing disturbance

(09 Marks)

OR

- 8 a. Describe the general maintenance requirement that must taken into account for an helicopter. (06 Marks)
- b. Mention and brief the factors that can affect the handling characteristics during take-off hover and landing for which flight test must be carried out. (10 Marks)

Module-5

- 9 a. Mention the advantages of rotorcraft on conventional aircraft and explain about general and operational requirement of civil rotorcraft. (10 Marks)
- b. Classify and explain rotorcraft vibration and its reduction methods. (06 Marks)

OR

- 10 Explain conceptual design of helicopters starting from aerofoil selection, blade twist, fuselage Empennage and tail rotors design. (16 Marks)

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