

# CBCS SCHEME

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15AE743

## Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019 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. Define rotor solidity, blade loading and figure of merit. (06 Marks)  
b. Derive momentum theory analysis during hovering flight. (10 Marks)

OR

- 2 a. Explain Blade flapping, lead-lag and coning of blades. (04 Marks)  
b. Derive blade element theory. (12 Marks)

### Module-2

- 3 a. Explain with a neat sketch, the forces acting on a helicopter during forward flight. (06 Marks)  
b. Explain the working principle of cyclic pitch in a helicopter. (04 Marks)  
c. What is ground effect? What are the precautions to be taken during take-off and landing? (06 Marks)

OR

- 4 a. What is the effect of gross weight during forward flight? (08 Marks)  
b. Explain helicopter turn with and without coning. (08 Marks)

### Module-3

- 5 a. What are the effects of Mach number and Reynold's number on rotor airfoil dynamics? (04 Marks)  
b. Explain with a neat sketch the spanwise pressure distribution over a twisted and untwisted blade. (08 Marks)  
c. Draw a sketch of the total wake during hovering and explain the phenomena. (04 Marks)

OR

- 6 a. What are the flow visualization techniques used to find rotor wakes? (08 Marks)  
b. What are the characteristics of rotor wake in forward flight? (08 Marks)

### Module-4

- 7 a. What are the disturbances that affect the stability of helicopter? (10 Marks)  
b. Explain the main rotor and tail rotor control. (06 Marks)

OR

- 8 a. What are the levels of Handling Qualities? (08 Marks)  
b. Describe the Hover flight test and the limitations if any. (08 Marks)

### Module-5

- 9 a. What are the differences between civil and military derivative of a helicopter? (06 Marks)  
b. What is the effect of blade twist? (04 Marks)  
c. Explain the various vibration of helicopter. (06 Marks)

OR

- 10 a. What are the empanages used in helicopter and explain their function? (08 Marks)  
b. What are the safety equipments required to be carried on board of helicopter and their function? (08 Marks)

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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.