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CBCS SCHEME

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15AE743

Seventh Semester B.E. Degree Examination, June/July 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. With the help of diagram, explain the major components of helicopter mentioning their applications and its advantages and disadvantages over fixed wing aircraft. **(10 Marks)**

b. Explain the following:
i) Disc loading
ii) Power loading
iii) Momentum theory for hovering flight **(06 Marks)**

OR

2 a. Give a brief note on rotor blade design and rotor configuration. **(10 Marks)**

b. Write a note on the function of tail rotor. **(06 Marks)**

Module-2

3 a. Derive an expression for relationship between the induced velocity and in the plane of the rotor and the velocity in the viva controller. **(10 Marks)**

b. Mention the forces acting on helicopters in forward flight and explain about methods of achieving translating flight. **(06 Marks)**

OR

4 a. Write notes on the following:
i) Effect of gross weight
ii) Effects of density altitude
iii) Lift to drag ratio **(10 Marks)**

b. Discuss the factors affecting maximum attainable forward speed. **(06 Marks)**

Module-3

5 a. What are rotor airfoil requirements and how it affects on Reynold's number and Mach number? **(06 Marks)**

b. With the help of suitable graph, explain the possible dynamic behavior as exhibited by a typical helicopter. **(10 Marks)**

OR

6 a. Explain the development of shockwave on a typical rotor airfoil with suitable diagram. **(08 Marks)**

b. Write a note on flow characteristics for rotor in forward flight near the ground. **(08 Marks)**

Module-4

7 a. What do you mean by dynamic stability? Explain briefly incidence disturbance and forward speed distance of static stability. **(10 Marks)**

b. Brief about yawing disturbance and side slip disturbance. **(06 Marks)**

OR

8 a. What are the factors that can affect the handling characteristics during take-off, lower low speed maneuvers and landing and for which flight test must be carried out? **(10 Marks)**

b. Explain the general maintenance requirement that must be taken into account for a helicopter. **(06 Marks)**

Module-5

9 a. Classify and explain rotorcraft vibration and its reduction methods. **(08 Marks)**

b. What is meant by Cooper Harper scale? Explain the flying qualities. **(08 Marks)**

OR

10 a. Briefly explain the designing of tail rotor and empennage of a typical helicopter. **(08 Marks)**

b. Discuss the effect of following design parameters of the main rotors on helicopter performance which should be taken into account in conceptual design stage:

i) Rotor diameter

ii) Rotor tip design. **(08 Marks)**

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