USN

10AE762

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Helicopter Dynamics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 Explain major parts and their functions of a helicopter for military transport role. **(20 Marks)**

2 A helicopter has the following data:
Gross weight 1363.6kg
Main rotor radius 4.0 meters
Rotor tip speed 207.3 m/sec
Rotor power 205.0 kW
For hovering conditions at sea level, compute the following:
i) Rotor disk loading
ii) Ideal power loading
iii) Thrust coefficient
iv) Figure of merit and actual power loading. **(20 Marks)**

3 a. Describe collective and cyclic pitch control. **(10 Marks)**
b. Describe blade flapping. **(10 Marks)**

4 a. What is meant by autorotation? How it helps in helicopter? **(04 Marks)**
b. What is autorotation index? Explain. **(02 Marks)**
c. How the ground effect affect forward flight? Explain with sketch. **(04 Marks)**
d. Derive the total power required for forward flight performance. **(10 Marks)**

PART – B

5 a. Define critical mach number. How mach number influence in the development of shock in rotorcraft. **(08 Marks)**
b. Explain the general requirements for a good helicopter rotor airfoil. **(04 Marks)**
c. What is meant by sweep angle? How it affects dynamic stall? **(08 Marks)**

6 a. Explain "TRIM OF HELICOPTER. How it varies in hovering flight? **(10 Marks)**
b. Write the equations of free flight trim with all equilibrium conditions. **(10 Marks)**

7 a. Describe the general and operational requirements of a helicopter. **(10 Marks)**
b. List the types of rotor craft vibration reduction methods and explain. **(10 Marks)**

8 a. Explain the design of horizontal stabilities for a helicopter. **(10 Marks)**
b. Explain the effects of fuselage drag during conceptual stage of helicopters. **(10 Marks)**

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