

**Total No. of Questions : 09**

**B.Tech.(ANE) (Sem.-6)**  
**HELICOPTER ENGINEERING**  
**Subject Code : ANE-324**  
**Paper ID : [A1230]**

**Time : 3 Hrs.**

**Max. Marks : 60**

**INSTRUCTION TO CANDIDATES :**

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

## SECTION-A

**Q1 Answer briefly:**

- Explain 'Coriolis Effect' with respect to helicopter rotors.
- Define figure of merit and its importance.
- Distinguish between 'Ring Guard' and 'Conventional' tail rotors.
- List merits and demerits of 'Helicopters' over 'Airplanes'.
- List merits & demerits of 'Synchropter' over 'Side-by-Side Rotor Helicopter'.
- Define tip speed. How it affects the helicopter performance during forward flight?
- Explain the functions of main gear box.
- Define bearing-less rotor. How pitch variation is achieved in bearing-less rotor?
- Explain the phenomenon of blade stall during forward flight of helicopter.
- Define Disk-Loading. List Merits and Demerits of 'Low Disk-Loading' over 'High Disk-Loading'.

### SECTION-B

- Q2 Explain physically the effect of 'vertical gust disturbance on the helicopter.
- Q3 A helicopter weighing 2550 kg has a rotor diameter of 14 m. The rotor rotates at 100 rpm and is hovering at sea level conditions. Find the disk loading, induced velocity and rotor thrust coefficient.
- Q4 Write a short note on 'vortex ring state' with the help of a neat labelled sketch.
- Q5 A tilt rotor helicopter weighs 8155 kg. The rotor diameter is 12 m. On the basis of momentum theory, estimate the power required for the rotorcraft to hover at sea level on standard day. Assume that the figure of merit is 0.75 and transmission losses amount to 7%.
- Q6 Explain the phenomenon of autorotation and its significance in case of helicopters.

### SECTION-C

- Q7 Define and classify vibration absorbers with respect to helicopters. List various sources of vibration in helicopters. Explain various passive vibration control systems with the help of sketches. (2,2,6)
- Q8 What are the basic controls of a helicopter? Describe how pilot uses these controls to achieve various desired flight conditions. (3,7)
- Q9 Write notes on the following : (2×5)
- a) Mangler and Squire method.
  - b) Various types of auto-rotative landings.