

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER–VIII • Remedial EXAMINATION – WINTER 2013

Subject Code: 180102**Date: 16/09/2013****Subject Name: Helicopter Engineering****Time: 03:00 pm – 05:30 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Draw a very clear picture of the velocity profile in hover and forward flight and explain in detail giving an example. **07**
- (b) Describe blade element theory in forward flight with a neat sketch of the forces/velocities acting on the blade. **07**
- Q.2** (a) (1) Describe the concept of boundary layer on an airfoil surface. **07**
 (2) Explain the reason for providing hinges in a helicopter blade. **07**
- (b) Describe the various types of helicopter rotors. **07**
- OR**
- (b) Explain the importance of Radius, Twist and Taper in a helicopter rotor blade from the perspective of conceptual design. **07**
- Q.3** (a) Describe the types of mechanical connections helicopter blades may have with the rotor. **07**
- (b) Describe momentum theory in axial climb along with all its assumptions and a neat sketch **07**
- OR**
- Q.3** (a) Describe the flow conditions around the rotor in axial flight, in detail and with neat sketches. **07**
- (b) Describe blade element theory in hover and axial flight with a neat sketch of the forces/velocities acting on the blade. **07**
- Q.4** (a) Describe momentum theory in axial descent along with all its assumptions and a neat sketch. **07**
- (b) Describe momentum theory in hover along with all its assumptions and limitations. Draw neat sketches to support the theory. **07**
- OR**
- Q.4** (a) Write a short note on: **07**
 (1) Helicopter blade design
 (2) Requirement of providing a flap and lag hinge.
- Q.4** (b) Describe momentum theory in forward flight along with all its assumptions and limitations. **07**
- Q.5** (a) Write a short note on (Draw neat sketches wherever relevant): **07**
 1. Coriolis effect
 2. Differences between a fixed-wing aircraft and a rotary wing aircraft.
- (b) Describe the degrees of freedom of a rotor blade. Explain the physical significance of the terms occurring in the equation of steady state. **07**
- OR**
- Q.5** (a) Write a short note on (Draw neat sketches wherever relevant): **07**
 1. Explain Reverse flow region
 2. Autorotation
- (b) Give examples of two helicopters and explain the differences between them. **07**
