Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2018 - 19 Examination

Semester: 7 **Date: 13/05/2019**
Subject Code: 03101403 **Time: 10:30am to 1:00pm**
Subject Name: Helicopter Engineering **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) **(15)**

1. The purpose of the drag hinge and dampers is to absorb the _____ and _____ of the rotor blades.
2. Solidity ratio = _____.
3. Inflow factor =_____.
4. Power required =P(T,V,ρ,S) =_____.
5. Rotational interference =_____.
6. What is the phenomenon in which the low pressure area producing an upward force?
7. Give any one assumption made for Blade Element Theory.
8. Give any one assumption made for Actuator Disk Theory.
9. Which airfoils are generally used in helicopter blades?
10. Which phenomenon is created when low-pressure air from horizontal slots gets in conjunction with downwash from the main rotor?
11. If you increase the bank angle to 60deg at constant altitude, the load factor becomes
    a) halved
    b) remains same
    c) Doubled
    d) Increases by $\frac{\sqrt{3}}{2}$
12. Which of the following used to perform roll during forward flight in helicopter?
    a) Tail rotor
    b) Collective Pitch
    c) Cyclic Pitch
    d) Aileron
13. Drag that can be found in hovering helicopter
    a) Induced drag
    b) Profile drag
    c) Parasite drag
    d) Both a) and b)
14. Effective Translational Lift is present during
    a) Vertical flow of air
    b) Horizontal flow of air
    c) Coanda Effect
    d) Ground Effect

15. In semi rigid rotor system, which of the following can be done?
    a) Lead and lag
    b) Feathering
    c) Flapping
    d) Both b) and c)

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Explain In Ground Effect and Out of Ground Effect.
B) Write short notes on relative wind for helicopters.
C) Write short notes on Fully Articulated Rotor System.
D) Write short notes on Forward flight, Rearward flight and Sideward flight.

Q.3 A) Derive an expression for Power required, Thrust and Efficiency of a rotor disk through momentum analysis. **(07)**

B) Derive the various parameters necessary during the forward flight. **(08)**

OR

B) Derive the various parameters necessary during the climbing flight. **(08)**

Q.4 A) Derive the necessary parameters required for hovercraft. **(07)**

OR

A) Derive the various parameters necessary during the forward climbing flight. **(07)**

B) Derive an expression for dT from Blade Element Analysis. **(08)**