RV Educational Institutions ®
RV College of Engineering ®

Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi

Approved by AICTE, New Delhi

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Academic year 2022-2023 (Odd Sem)

DEPARTMENT OF

# AEROSPACE ENGINEERING

| Date | Jan 2023 | Maximum Marks | 50+10 |
|---|---|---|---|
| Course Code | 22EM102 | Duration | 120 Min |
| Sem | I Semester | Offline Test-I | |
| **Introduction to Drone Technology** | | | |

**PART – A** (10 Marks)

| | QUESTIONS | M | CO | BT |
|---|---|---|---|---|
| 1. | The abbreviation HALE stands for High altitude. | 01 | CO1 | 1 |
| 2. | The Rotorcraft that employs the design in which two rotors are arranged one behind the other is called as _____. | 01 | CO2 | 1 |
| 3. | The force that opposes the forward movement of aircraft in air _____. | 01 | CO2 | 1 |
| 4. | The part of aircraft that provides it a longitudinal stability _____. | 01 | CO3 | 1 |
| 5. | The control surface of aircraft that helps in yawing _____. | 01 | CO2 | 1 |
| 6. | The commonly used Quadcopter battery is Lithium polymer. | 01 | CO1 | 1 |
| 7. | The UAVs with the size ranging from 50cm and upto one or two meter is classified as _____. | 01 | CO2 | 1 |
| 8. | The UAVs that can fly up to an altitude of 5000-15000m and have an endurance of 24 hour is classified as _____. | 01 | CO2 | 1 |
| 9. | List any two made in India Drones. Netra, Nishant | 02 | CO1 | 1 |

Academic year 2022-2023 (Odd Sem)

## Part B

| Sl. No. | Questions | M | BT | CO |
|---|---|---|---|---|
| 1. | Summarize the History of Drones by considering important events that led to the evolution of Drones. | 10 | 1 | 1 |
| 2. | Classify and explain briefly about the following UAVs with the help of illustration<br>a)UAVs based on size<br>b)UAVs based on Range and Endurance | 10 | 2 | 2 |
| 3. | India is highly potential in the field of Developing indigenous Drones, Justify this statement by providing an suitable example regarding its achievement. | 10 | 2 | 1 |
| 4. | Describe briefly about the parts of fixed wing UAV with the help of labeled diagram. | 10 | 1 | 2 |
| 5a | Define the following terms<br>a)Range<br>b)Endurance<br>c)Altitude<br>d)Hover<br>e)Center of lift | 05 | 1 | 1 |
| 5b. | Explain briefly the forces acting on the aircraft with the help of neat diagram. | 05 | 1 | 1 |

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

| Marks Distribution | Particulars | | CO1 | CO2 | CO3 | CO4 | L1 | L2 | L3 | L4 | L5 | L6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Test | Max Marks | 34 | 25 | 01 | 00 | 40 | 20 | 00 | 00 | 00 | 00 |

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# DEPARTMENT OF AEROSPACE ENGINEERING

| | | | |
|---|---|---|---|
| Date | Feb 2023 | Maximum Marks | 50-10 |
| Course Code | 22EM102 | Duration | 120 Min |
| Sem | I Semester | Offline Test-2 | |
| | Introduction to Drone Technology | | |

(10 Marks)

**PART – A**

| | QUESTIONS | M | CO | BT |
|---|---|---|---|---|
| 1. | The formula for calculating lift force on a body is _____. | 01 | CO3 | 2 |
| 2. | The wing with the high aspect ratio is suitable for more _____. | 01 | CO4 | 2 |
| 3. | The condition beyond which the increased angle of attack lead to loss of lift is generally called as _____ | 01 | CO2 | 2 |
| 4. | The speed regime in which mach number >1 is called as _____ | 01 | CO2 | 1 |
| 5. | Reynolds number is a ratio of _____ to _____ | 01 | CO1 | 2 |
| 6. | The lowest mach number at which the airflow over somepoint of the aircraft reaches the speed of sound is generally known as _____. | 01 | CO2 | 1 |
| 7. | The type of Engine that has triangular shaped rotor mounted inside the stator is called as _____. | 01 | CO2 | 1 |
| 8. | The positive electrode in lithium ion battery is usually made up of _____ | 01 | CO4 | 1 |
| 9. | List the major components of gas turbine engine based on the order in which the air flows _____, _____, _____ and _____ | 02 | CO2 | 1 |

# Part B

| Sl. No. | Questions | M | BT | CO |
|---|---|---|---|---|
| 1. | List and explain the following with the help of labeled sketch.<br>a)Airfoil terminology<br>b)Wing terminology | 10 | 1 | 2 |
| 2a | Observe a flapping wing bird or an insect. Comment on the aerodynamics involved in its flight with the help of illustration. | 5 | 2 | 3 |
| 2b | Compare the Laminar and Turbulent boundary layer with the help of illustration. | 5 | 2 | 1 |
| 3. | Describe the types of drag acting on a UAV with the help of formula.Present a graph showing the variation of drag with increased airspeed and explain the nature of graph. | 10 | 2 | 2 |
| 4. | Describe the construction and working of 4 stroke gasoline engine with the help of illustration. | 10 | 1 | 4 |
| 5 | Explain the following with the help of labeled sketch.<br>a)Lithium ion battery<br>b)Fuel cell | 10 | 1 | 3 |

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

| Marks Distribution | Particulars | | CO1 | CO2 | CO3 | CO4 | L1 | L2 | L3 | L4 | L5 | L6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Test | Max Marks | 06 | 26 | 16 | 12 | 36 | 24 | 00 | 00 | 00 | 00 |

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DEPARTMENT OF

# AEROSPACE ENGINEERING

| Date | March 2023 | Maximum Marks | 50+10 |
|---|---|---|---|
| Course Code | 22EM102 | Duration | 120 Min |
| Sem | I Semester | Offline Test-3 | |
| **Introduction to Drone Technology** | | | |

**PART – A** (10 Marks)

| | QUESTIONS | M | CO | BT |
|---|---|---|---|---|
| 1. | The stress that resists the force to cause one layer of a material to slide over an adjacent layer Shear | 01 | CO3 | 2 |
| 2. | The structural member that provide an airfoil shape Spars | 01 | CO4 | 2 |
| 3. | The load factor is defined as the ratio of stress to strain | 01 | CO2 | 2 |
| 4. | The fibre arrangement in skin fabric is called as_____ | 01 | CO2 | 1 |
| 5. | Name any one resin material that is used in UAV material construction | 01 | CO1 | 1 |
| 6. | The wing spar of an aircraft is subjected to _____ stress. | 01 | CO2 | 1 |
| 7. | The working principle of MEMS Gyroscope is _____. | 01 | CO2 | 2 |
| 8. | Most RADARs operate in _____ frequency bands. | 01 | CO4 | 1 |
| 9. | List any two dispensable payloads in Drone | 02 | CO2 | 1 |

## Part B

| Sl. No. | Questions | M | BT | CO |
|---|---|---|---|---|
| 1. | Explain the Major Structural stresses action on Drone with an example for each. | 10 | 1 | 2 |
| 2. | Describe about the structural members used in the construction of drone with the help of diagram. | 10 | 2 | 3 |
| 3. | Describe the methods involved in the construction of composite parts with the help of illustration. | 10 | 2 | 2 |
| 4. | Briefly explain the working of the following<br>a)Barometric pressure sensor<br>b)Accelerometer<br>C)Gyroscope | 10 | 1 | 4 |
| 5 | Describe the working of RADAR with help of schematic diagram and list it's application | 10 | 1 | 3 |

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

| Marks Distribution | Particulars | | CO1 | CO2 | CO3 | CO4 | L1 | L2 | L3 | L4 | L5 | L6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Test | Max Marks | 01 | 26 | 21 | 12 | 36 | 24 | 00 | 00 | 00 | 00 |

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USN | R | V | C | E | 2 | 2 | B | E | I | 0 | 10

# RV COLLEGE OF ENGINEERING®

**(An Autonomous Institution affiliated to VTU)**

**I Semester B. E. Examinations May-2023**

**Common to all programs**

## INTRODUCTION TO DRONE TECHNOLOGY (ELECTIVE)

***Time: 03 Hours*** ***Maximum Marks: 100***

***Instructions to candidates:***

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. Question number 2 is compulsory. Choose any one full question from 3 or 4, 5 or 6, 7 or 8 and 9 or 10.

### PART-A

| | | | |
|---|---|---|---|
| 1 | 1.1 | The rotorcraft that employs the design in which two rotors are arranged one above the other is called as _____. | 01 |
| | 1.2 | The part of aircraft that provides it a lateral stability is _____. | 01 |
| | 1.3 | The *UAVs* with the wingspan of the order of 5 to 10$m$ and can carry payload upto 200$kg$ are considered as _____. | 01 |
| | 1.4 | The *UAVs* that can fly over 15000$m$ of altitude and have an Endurance of 24 + hour are classified as _____. | 01 |
| | 1.5 | The condition beyond which the increased angle of attack lead to loss of lift is generally called as _____. | 01 |
| | 1.6 | Mach number is a ratio of _____ to _____. | 01 |
| | 1.7 | List any two major components of Reciprocating engine based on the order in which the air flows _____ and _____. | 01 |
| | 1.8 | The speed regime in which Mach number < 1 is called as _____. | 01 |
| | 1.9 | The type of Engine that has triangular shaped rotor mounted inside the stator is called as _____. | 01 |
| | 1.10 | The negative electrode in lithium-ion battery is usually made up of _____. | 01 |
| | 1.11 | The force that allows the aircraft to move forward is _____. | 01 |
| | 1.12 | The high bypass ratio Turbofan engine is suitable for _____ aircraft. | 01 |
| | 1.13 | The wing skin of an aircraft is subjected to _____ stress. | 01 |
| | 1.14 | The major fuselage structural member that provides a fuselage its shape is _____. | 01 |
| | 1.15 | The *MEMS* based Gyroscope works on the principle of _____. | 01 |
| | 1.16 | Name any one matrix material that is used in composite material construction. | 01 |
| | 1.17 | The synthetic aperture *RADAR* in Drone is used for _____. | 01 |
| | 1.18 | The load factor is defined as _____. | 01 |
| | 1.19 | The abbreviation *DGCA* stands for _____. | 01 |
| | 1.20 | Laser target designator is a _____ type of payload. | 01 |

### PART-B

| | | | |
|---|---|---|---|
| 2 | a | Describe briefly the parts of Quadcopter with the help of labeled diagram. | 08 |
| | b | Summarize the Technological evolution of drones over the course of history. | 08 |
| | | | |

| | | | |
|---|---|---|---|
| 3 | a | List and explain the following with the help of labeled sketch.<br>i) Airfoil terminology<br>ii) Mechanism of lift generation | 08 |
| | b | Describe the force of lift acting on an *UAV* with the help of suitable formulae. Present a graph showing the variation of coefficient of lift with increased angle of attack and explain the nature of graph. | 08 |
| | | **OR** | |
| 4 | a | Compare the Laminar and Turbulent boundary layer with the help of illustration. | 08 |
| | b | Describe the force of drag acting on an *UAV* with the help of suitable formulae. Present a graph showing the variation of drag with increased speed and explain the nature of graph. | 08 |
| | | | |
| 5 | a | Describe the construction and working of a 4 stroke gasoline engine with the help of illustration. | 08 |
| | b | Explain the following with the help of labeled sketch:<br>i) Solar cell<br>ii) Fuel cell. | 08 |
| | | **OR** | |
| 6 | a | Describe the construction and working of a gas turbine jet engine with the help of illustration. | 08 |
| | b | Derive the expression for Power required to generate a lift by propeller considering standard assumptions. | 08 |
| | | | |
| 7 | a | Explain the structural members used in the construction of Drones with the help of illustrations. | 08 |
| | b | With the help of *V n* diagram, explain the significance of load-factor and its relation with the speed of an aircraft. | 08 |
| | | **OR** | |
| 8 | a | Explain the structure and materials used in the construction of sandwich panel structure with the help of illustration. | 08 |
| | b | List the steps involved in the construction of composite parts and explain each step with illustrations. | 08 |
| | | | |
| 9 | a | Distinguish between the Dispensable and non-Dispensable payload with help of integrated system description and diagram. | 08 |
| | b | Briefly elaborate on the working of the following:<br>i) Barometric pressure sensor ii) Magnetometer | 08 |
| | | **OR** | |
| 10 | a | Describe the following according to *DGCA* rules:<br>i) Drone zones<br>ii) Classification of Drones<br>iii) Eligibility for remote pilot license. | 08 |
| | b | Briefly describe the working of the following:<br>i) Gyroscope ii) Accelerometer. | 08 |