22EM102

USN | | | | | | | | | | |

**RV COLLEGE OF ENGINEERING**
**Autonomous Institution affiliated to VTU**
**I Semester B.E. April -2023 Examinations**
**DEPARTMENT OF AEROSPACE ENGINEERING**
**INTRODUCTION TO DRONE TECHNOLOGY**
**(2022 SCHEME)**
**(Non-Integrated Course)**

***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. In Part B question number 2 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, and 9 and 10.

**PART-A (Objective type for one or two marks)**

| | | | |
|---|---|---|---|
| 1 | 1.1 | The rotorcraft that employs the design in which two rotors are arranged one behind the other is called as _____ | 1 |
| | 1.2 | The part of aircraft that provides it a longitudinal stability _____ | 1 |
| | 1.3 | The UAVs with the size ranging from 50cm and upto one or two meter is classified as _____ | 1 |
| | 1.4 | The UAVs that can fly upto an Altitude of 5000-15000m and have an Endurance of 24 hour is classified as _____ | 1 |
| | 1.5 | The condition beyond which the increased angle of attack lead to loss of lift is generally called as _____ | 1 |
| | 1.6 | Reynolds number is a ratio of _____ to _____ | 1 |
| | 1.7 | List the major components of gas turbine engine based on the order in which the air flows _____, _____,_____and_____ | 1 |
| | 1.8 | The speed regime in which Mach number >1 is called as _____ | 1 |
| | 1.9 | The type of Engine that has triangular shaped rotor mounted inside the stator is called as _____ | 1 |
| | 1.10 | The positive electrode in lithium-ion battery is usually made up of _____ | 1 |
| | 1.11 | The formula for calculating lift force on a body is _____ | 1 |
| | 1.12 | Bypass ratio of Turbofan engine is defined as | 1 |
| | 1.13 | The wing spar of an aircraft is subjected to _____ stress | 1 |
| | 1.14 | The structural member that provides an airfoil shape is _____ | 1 |
| | 1.15 | The MEMS based magnetometer works on the principle of _____ | 1 |
| | 1.16 | Name any two-resin material that is used in UAV material construction | 1 |
| | 1.17 | The Gyroscope in Drone is used for _____. | 1 |
| | 1.18 | The load factor and bank angle are related by the formula _____ | 1 |

| | | | |
|---|---|---|---|
| | 1.19 | The working principle of RADAR _____. | 1 |
| | 1.20 | Thermal imagers work in the wavelength range of _____to _____ | 1 |

**PART-B (Maximum subdivisions is limited to 3 in each question)**

| | | | |
|---|---|---|---|
| | | **UNIT-I** | |
| 2 | a | Describe briefly the parts of fixed wing UAV with the help of labeled diagram | 8 |
| | b | India has high potential in the field of Development of indigenous Drones, justify this statement providing a suitable example regarding its achievement. | 8 |

| | | | |
|---|---|---|---|
| | | **UNIT-II** | |
| 3 | a | List and explain the following with the help of labeled sketch.<br>a) Airfoil terminology<br>b) Wing terminology | 8 |
| | b | Describe the types of drag acting on an UAV with the help of suitable formulae. Present a graph showing the variation of drag with increased airspeed and explain the nature of graph | 8 |
| | | **OR** | |
| 4 | a | Compare the Laminar and Turbulent boundary layer with the help of illustration. | 8 |
| | b | Observe a flapping wing bird or an insect, comment on aerodynamics involved in its flight with the help of illustration | 8 |

| | | | |
|---|---|---|---|
| | | **UNIT-III** | |
| 5 | a | Describe the construction and working of 4 stroke gasoline engine with the help of illustration. | 8 |
| | b | Explain the following with the help of labeled sketch.<br>a) Lithium-ion battery<br>b) Fuel cell | 8 |
| | | **OR** | |
| 6 | a | Describe the construction and working of gas turbine jet engine with the help of illustration. | 8 |
| | b | Illustrate the Rotary engine, explain the construction and working of it | 8 |

| | | | |
|---|---|---|---|
| **UNIT-IV** | | | |
| 7 | a | Explain the Major Structural stresses action on Drone with an example for each | 8 |
| | b | List the materials used in the construction of an Aerial Vehicle and briefly explain them. | 8 |
| | | **OR** | |
| 8 | a | Explain the structure and materials used in the construction of sandwich panel structure with the help of illustration. | 8 |
| | b | How load factor and speed are related, Explain using flight envelope. | 8 |

| | | | |
|---|---|---|---|
| **UNIT-V** | | | |
| 9 | a | Describe the working of RADAR with help of a schematic diagram and list it's applications | 8 |
| | b | Briefly elaborate on the working of the following<br>a) Barometric pressure sensor<br>b) Accelerometer | 8 |
| | | **OR** | |
| 10 | a | Distinguish between the Dispensable and non-Dispensable payload . | 8 |
| | b | Briefly describe the working of the following.<br>a) Gyroscope<br>b) Magnetometer | 8 |

Signature of Scrutinizer: Signature of Chairman

Name: Name: