Academic year 2023-24(odd sem)

DEPARTMENT OF

AEROSPACE ENGINEERING

Date	NOV 2023	Maximum Marks	50
Course Code	AS114AT	Duration	90 Min
Sem	I Semester	Offline Test-1	
Introduction to Drone Technology			

Sl. No.	Questions	M	BT	CO
1.	Provide an Overview of UAV system with the help of neat diagram highlighting the importance of subsystems.	10	1	1
2.	Classify and explain briefly about the following UAVs a)UAVs based on airframe b)UAVs based on Range and Endurance	10	2	2
3.	India has high potential in the field of Developing indigenous Drones, Justify this statement providing an atleast four suitable example regarding its achievement.	10	3	1
4.	Describe briefly about the parts of Quadcopter with the help of labeled diagram.	10	2	2
5a	Define the following terms a)Range b)Endurance c)Altitude d)Maneuver e)Surveillance	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	30	20	00	00	30	10	10	00	00	00

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Academic year 2023-2024 (Odd Sem)

DEPARTMENT OF
AEROSPACE ENGINEERING

Date	December 2023	Maximum Marks	50
Course Code	AS114AT	Duration	90 Min
Sem	I Semester		

Sl. No.	Questions	M	BT	CO
1.	List and explain the following with the help of labeled sketch. a)Airfoil terminology b)Wing terminology	10	1	2
2a	Observe a flapping wing bird or an insect, comment on 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 an 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 Turbojet engine with the help of illustration.	10	1	4
5	Explain the following with the help of labeled sketch. a)Lithium ion battery 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	05	20	15	10	30	20	00	00	00	00

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Academic year 2023-24(ODD SEM)

DEPARTMENT OF
AEROSPACE ENGINEERING

Date	January 2024	Maximum Marks	50
Course Code	AS114AT	Duration	90 Min
Sem	I Semester		

Sl. No.	Questions	M	BT	CO
1.	Discuss the construction and working of 4 stroke gasoline engine with the help of illustration	10	1	2
2.	Write a brief note on the following: a)BLDC motor b)Solar cell	10	2	3
3.	Explain the Major Structural stresses action on Drone with an example for each.	10	2	2
4.	Describe about the structural members used in the construction of drone with the help of diagram. Wing & Fuselage	10	1	4
5	Describe the methods involved in the construction of composite parts with the help of illustration.	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	00	20	20	10	30	20	00	00	00	00

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truss
monocoque
semi
wing load.
shear
autoclave curing

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AS114ATB / 22EM102 / 22EM202

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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

I / II Semester B. E. Regular / Supplementary Examinations Feb-2024

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 history of *UAVs* dates back to _____.	01
	1.2	Unmanned Aerial Systems (*UAS*) are needed for _____ missions.	01
	1.3	In India, drone operations are regulated by _____.	01
	1.4	*UAV* systems typically consist of airframe, _____ and payload.	01
	1.5	*UAVs* are classified into various classes based on their _____.	01
	1.6	The aerodynamic lift generated by an airfoil depends on its _____.	01
	1.7	Fixed-wing *UAVs* generate lift using _____.	01
	1.8	Rotary-wing *UAVs* achieve lift through _____.	01
	1.9	Flapping-wing *UAVs* mimic the flight of _____.	01
	1.10	*UAVs* can be powered by piston engines, _____ and electric systems.	01
	1.11	Gas turbine engines are known for their high _____.	01
	1.12	Electric-powered *UAVs* offer the advantage of _____.	01
	1.13	The term "thrust" refers to the force that propels a *UAV* in the _____ directions.	01
	1.14	Powered lift technology is crucial for _____.	01
	1.15	The structural integrity of *UAVs* is affected by _____.	01
	1.16	Carbon fiber composites are favored for *UAV* construction due to their high _____.	01
	1.17	Truss structures are commonly used in _____ *UAVs*.	01
	1.18	Magnetometers provide heading information based on _____,	01
	1.19	*RADAR* is useful for obstacle detection and mapping in _____ conditions.	01
	1:20	No Drone Zones often include areas near _____.	01

PART-B

2	a	Discuss the historical development of Unmanned Aerial Vehicle (*UAVs*) and their evolution into essential tools for various missions.	08
	b	Analyze the specific role of *UAVs* in India's context and classify *UAVs* based on size, range, and endurance.	08

3	a	Explain the nomenclature used to describe airfoils and provide an example.	
	b	Describe the generation of lift on airfoils and wings, highlighting the key principles involved.	
		OR	
4	a	Explain the basic aerodynamics of fixed-wing, rotary-wing (helicopter), and flapping-wing *UAVs*. Discuss the key differences in how lift is generated and controlled in these *UAV* types.	
	b	Discuss the principles of airfoil nomenclature and the basic aerodynamics of fixed-wing *UAVs*. Calculate the lift force generated by a fixed-wing *UAV* with a wing area of $4\,sq.m.$, an airfoil with a lift coefficient (Cl) of 0.6, an air density of $1.2kg/m^3$, and a velocity of $30m/s$.	
5	a	Explain the principles of thrust generation in *UAVs* and the concept of powered lift. Describe a scenario where powered lift might be advantageous for a *UAV*. Provide an example of *UAV* that uses powered lift technology.	
	b	Discuss the sources of power commonly used for *UAVs*, including piston engines, rotary engines, gas turbine engines, and electric/battery-powered systems. Compare the advantages and disadvantages of each power source in the context of *UAV* applications.	
		OR	
6	a	Explain the working principle of a gas turbine engine commonly used in *UAVs*. Provide a brief overview of the components involved in a gas turbine engine and their functions.	
	b	Discuss the advantages and challenges of using electric/battery-powered systems in *UAVs*. Provide a numerical example to calculate the flight endurance of an electric-powered *UAV* with a battery capacity of $10000mAh$ and a power consumption rate of $200W$.	
7	a	Explain the various types of loads that act on *UAVs* during flight, including aerodynamic loads, gravitational loads, and inertial loads. Provide examples of how these loads can affect the design and structural integrity of a *UAV*.	
	b	Discuss the materials commonly used for constructing *UAVs* and the advantages and disadvantages of each material type. Provide examples of application where specific materials excel.	
		OR	
8	a	Explain various construction techniques employed in *UAV* manufacturing, including monocoque, semi-monocoque, and truss structures. Provide examples of when each technique is advantageous and the trade-offs involved.	
	b	Explain the concept of structural load testing in *UAV* manufacturing and its significance in ensuring airframe integrity. Provide an example of a load test procedure for a fixed-wing *UAV*.	

	a	Explain the fundamental principles of operation for barometers and accelerometers in *UAVs*. Discuss how these sensors contribute to the flight stability and control of unmanned aerial vehicles.	08
	b	Explain the function and significance of magnetometers, *RADAR*, and range finders in *UAVs*. Provide examples of scenarios where these sensors are essential for *UAV* operations.	08
		OR	
10	a	Differentiate between non-dispensable and dispensable payloads used in *UAVs*, with a focus on optical, electrical, weapon, and imaging payloads. Discuss the types of missions and applications where each category of payload is commonly employed.	08
	b	Explain the concept of drone regulations, focusing on *DGCA* (Directorate General of Civil Aviation) regulations, operational and procedural requirements, and "No Drone Zones". Provide an example of a situation where adherence to these regulations is crucial for *UAV* operators.	08