Hall Ticket No | | | | | | | | | | | Question Paper Code: AAEB32

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-II

B.Tech V Semester End Examinations, November 2020

Regulations: IARE - R18

UNMANNED AIR VEHICLES

AERONAUTICAL ENGINEERING

Time: 3 hour Maximum Marks: 70

Answer ONE Question from each MODULE
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE-I

1. (a) List the categories of systems based upon air vehicle types and describe them. [**7m**]
   (b) Explain the following design consideration of UAS [**7m**]
      1. Air vehicle selection based speed
      2. Environmental conditions

2. (a) Write short notes on the importance of Interface between the sub-systems and with the other systems of UAS. [**7m**]
   (b) How payload can influence the airframe selection for UAS? [**7m**]

MODULE-II

3. (a) Illustrate the Parasitic Drag, discuss in detail? [**7m**]
   (b) Explain Rotary-wing Aerodynamics. [**7m**]

4. (a) What are two main causes for an aircraft to have a high response to atmospheric turbulence, discuss by considering wing loading? [**7m**]
   (b) Interpret the aerodynamics of UAVs with respect to packaging density and scaling effects. [**7m**]

MODULE-III

5. (a) a) Explain (i) Low aerodynamic drag, (ii) High disposable load fraction, and (iii) Power-plant Selection for Long-endurance, Long-range Role UAV designer. [**7m**]
   (b) Compare MALE and HALE UAVs. [**7m**]

6. (a) Explain Close-range/ Battlefield Non- VTOL aircraft systems with necessary diagrams. [**7m**]
   (b) Write about MUAVs technologies. [**7m**]

MODULE-IV

7. (a) Describe the different communication media between UAV and control station. [**7m**]

   (b) Explain radio frequency band designations and radio/microwave frequency allocation. [**7m**]

8. (a) Interpret the Vulnerability of UAV system and possible measures to reduce it. [**7m**]

   (b) Explain NAVSTAR GPS mentioning different types and detailed services. [**7m**]

MODULE-V

9. (a) Explain HTOL spatially stabilized configuration using AFCS. [**7m**]

   (b) Illustrate the control and stability aspects of Coaxial-rotor Helicopter with necessary AFCS. [**7m**]

10. (a) How the control and stability can be achieved for SMR helicopter, explain with necessary diagrams and examples. [**7m**]

    (b) Why the payload control is necessary and how can it be achieved in UAS? [**7m**]

****END OF EXAMINATION****

COURSE OBJECTIVES:

The course should enable the students to:

1	Introduce the major subsystems and the fundamental design phases of Unmanned Air Vehicle Systems (UAS).
2	Familiarize the basic aerodynamics and airframe configurations of unmanned air vehicles (UAVs).
3	Acquaint the various communication and navigation systems of UAVs.
4	Accustom the basic control and stability aspects of UAVs

COURSE OUTCOMES:

After successful completion of the course, students should be able to:

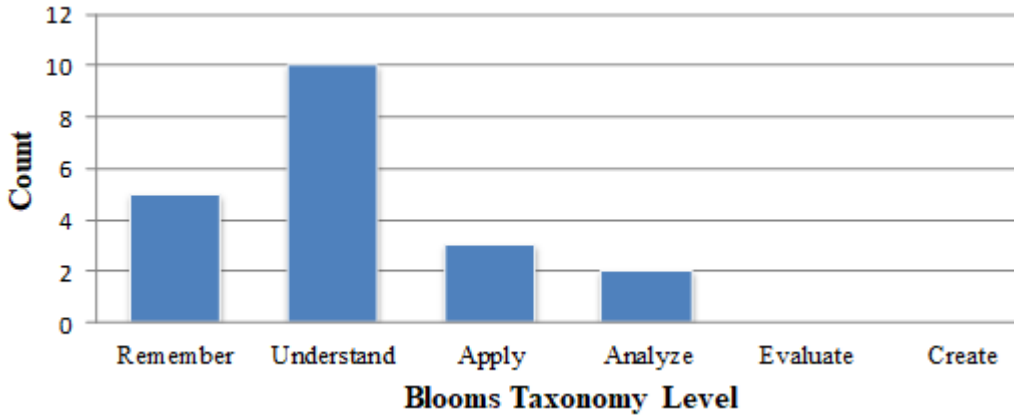
CO 1	Recall the functions of each major sub-systems of the unmanned air vehicle systems to select the suitable subsystem.
CO 2	Demonstrate the knowledge of basic design phases which will be considered for the design of unmanned air vehicle systems.
CO 3	Recognize the significant role requirement parameters which determine the shape, size, performance, and costs of UAV systems as per role requirement.
CO 4	Demonstrate the knowledge of the different types of drag in fixed, rotary-wing aircraft and UAV response to air turbulence in selecting the suitable airframe configuration.
CO 5	Illustrate the different types of airframe configurations available for unmanned air vehicle systems.
CO 6	Outline the scaling effects, package density, basic aerodynamics, and structures concepts used during the design of UAVs.
CO 7	Select a suitable power-plant based on power generation systems for the given role requirement.
CO 8	Analyze the attributes, performance, design issues and compromises of different types of aircrafts for UAV systems.
CO 9	Identify the appropriate communication and navigation systems for the UAVs as per the role requirements.
CO 10	Categorize the different techniques used to achieve the control and stability of UAV systems.
CO 11	Apply the fundamental concepts of UAS in design and development of UAV systems for real-world application

MAPPING OF SEMESTER END EXAMINATION QUESTIONS TO COURSE OUTCOMES

Q.No		All Questions carry equal marks	Taxonomy	CO's	PO's
1	a	List the categories of systems based upon air vehicle types and describe them.	Remember	CO 1	PO 1
	b	Explain the following design consideration of UAS 1. Air vehicle selection based speed 2. Environmental conditions	Understand	CO 1	PO 1
2	a	Write short notes on the importance of Interface between the sub-systems and with the other systems of UAS.	Remember	CO 1	PO 1
	b	How payload can influence the airframe selection for UAS?	Remember	CO 1	PO 1
3	a	Illustrate the Parasitic Drag, discuss in detail?	Understand	CO 4	PO 1,2
	b	Explain Rotary-wing Aerodynamics.	Understand	CO 4	PO 1,2
4	a	What are two main causes for an aircraft to have a high response to atmospheric turbulence, discuss by considering wing loading?	Understand	CO 4	PO 1,2
	b	Interpret the aerodynamics of UAVs with respect to packaging density and scaling effects.	Understand	CO 6	PO 1
5	a	Explain (i) Low aerodynamic drag, (ii) High disposable load fraction, and (iii) Power-plant Selection for Long-endurance, Long-range Role UAV designer.	Understand	CO 8	PO 1
	b	Compare MALE and HALE UAVs.	Analyze	CO 8	PO 1
6	a	Explain Close-range/ Battlefield Non- VTOL aircraft systems with necessary diagrams.	Understand	CO 8	PO 1
	b	Write about MUAVs technologies.	Remember	CO 8	PO 1
7	a	Describe the different communication media between UAV and control station.	Remember	CO 9	PO 1,2
	b	Explain radio frequency band designations and radio/microwave frequency allocation.	Understand	CO 9	PO 1,2
8	a	Interpret the Vulnerability of UAV system and possible measures to reduce it.	Apply	CO 9	PO 1,2
	b	Explain NAVSTAR GPS mentioning different types and detailed services.	Understand	CO 11	PO 1,2
9	a	Explain HTOL spatially stabilized configuration using AFCS.	Apply	CO 10	PO 1,2

	b	Illustrate the control and stability aspects of Coaxial-rotor Helicopter with necessary AFCS.	Understand	CO 10	PO 1,2
10	a	How the control and stability can be achieved for SMR helicopter, explain with necessary diagrams and examples.	Analyze	CO 10	PO 1,2
	b	Why the payload control is necessary and how can it be achieved in UAS?	Apply	CO 10	PO 1,2

KNOWLEDGE COMPETENCY LEVELS OF MODEL QUESTION PAPER



Signature of Course Coordinator
Dr. Praveen kumar Balaguri,
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HOD, AE