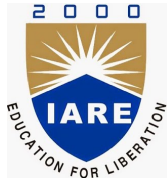


Hall Ticket No

--	--	--	--	--	--	--	--	--	--

Question Paper Code: AAEB32



INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

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

- (a) Explain briefly the functions of major sub-systems of UAS. [7m]

(b) Why do we need UAS? Discuss in detail. [7m]
- (a) Explain the design phases of UAS. [7m]

(b) Outline the functions of Navigation Systems and Communication Systems of UAS [7m]

MODULE-II

- (a) Illustrate the Lift Induced Drag in detail with necessary diagrams. [7m]

(b) How does airspeed, wing loading and drag are related? Discuss with necessary diagrams? [7m]
- (a) Classify different VTOL Airframe Configurations [7m]

(b) Explain Ducted Fan Aircraft and Jet-life Aircraft airframe configurations. [7m]

MODULE-III

- (a) What are the three main concerns of the Long-endurance, Long-range Role UAV designer, discuss in detail with the necessary diagram? [7m]

(b) Explain the Medium-range, Tactical VTOL (Rotary wing) UAVs. [7m]
- (a) Explain Close-range/ Battlefield VTOL aircraft systems with necessary details. [7m]

(b) Identify the different novel hybrid aircraft configurations, discuss with necessary examples? [7m]

MODULE-IV

- (a) a) What are the different ways of achieving communication between GCS and UAV, explain in detail? [7m]

(b) Identify the radio frequencies and LOS range with necessary diagrams. [7m]

8. (a) Write short notes on (i) Transmitter power output and receiver sensitivity, (ii) Antenna gain, (iii) Path loss, and (iv) Multi-path propagation. [7m]
(b) Identify the different types of Antennas, discuss them briefly. [7m]

MODULE-V

9. (a) Explain HTOL Aero-stable configuration with AFCS. [7m]
(b) Outline the control and stability aspects of Single-main- rotor helicopter with AFCS diagram. [7m]
10. (a) Write the method of aerodynamic control of Coaxial-rotor helicopter using AFCS. [7m]
(b) Distinguish Directional Airframe Coaxial-rotor Helicopter (CRH) and Symmetrical Airframe Coaxial-rotor Helicopter with the help of AFCS [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:

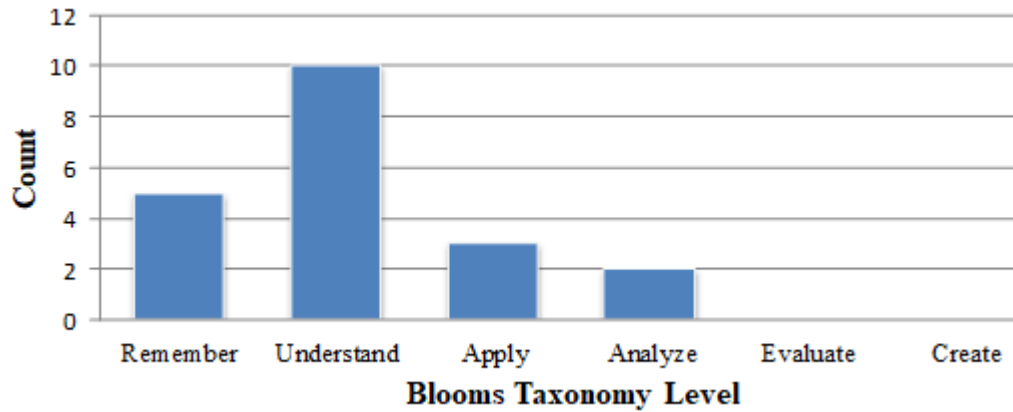
CO 1	Recall the functions of each major sub-systems of the unmanned air vehicle systems to select the suitable subsystem.
CO 2	Demonstrate the knowledge of basic design phases which will be considered for the design of unmanned air vehicle systems.
CO 3	Recognize the significant role requirement parameters 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	Explain briefly the functions of major sub-systems of UAS.	Understand	CO 1	PO 1
	b	Why do we need UAS? Discuss in detail.	Remember	CO 1	PO 1
2	a	Explain the design phases of UAS.	Understand	CO 2	PO 1,2
	b	Outline the functions of Navigation Systems and Communication Systems of UAS	Understand	CO 1	PO 1
3	a	Illustrate the Lift Induced Drag in detail with necessary diagrams.	Understand	CO 4	PO 1,2
	b	How does airspeed, wing loading and drag are related? Discuss with necessary diagrams?	Remember	CO 4	PO 1,2
4	a	Classify different VTOL Airframe Configurations	Analyze	CO 4	PO 1,2
	b	Explain Ducted Fan Aircraft and Jet-life Aircraft airframe configurations.	Understand	CO 8	PO 2
5	a	What are the three main concerns of the Long-endurance, Long-range Role UAV designer, discuss in detail with the necessary diagram?	Remember	CO 8	PO 1
	b	Explain the Medium-range, Tactical VTOL (Rotary wing) UAVs?	Understand	CO 8	PO 1
6	a	Explain Close-range/ Battlefield VTOL aircraft systems with necessary details.	Understand	CO 8	PO 1
	b	Identify the different novel hybrid aircraft configurations, discuss with necessary examples?	Apply	CO 8	PO 1
7	a	What are the different ways of achieving communication between GCS and UAV, explain in detail??	Remember	CO 9	PO 1,2
	b	Identify the radio frequencies and LOS range with necessary diagrams	Apply	CO 9	PO 1,2
8	a	Write short notes on (i) Transmitter power output and receiver sensitivity, (ii) Antenna gain, (iii) Path loss, and (iv) Multi-path propagation.	Remember	CO 9	PO 1,2
	b	Identify the different types of Antennas, discuss them briefly.	Apply	CO 11	PO 1,2
9	a	Explain HTOL Aero-stable configuration with AFCS.	Understand	CO 10	PO 1,2
	b	Outline the control and stability aspects of Single-main- rotor helicopter with AFCS diagram.	Understand	CO 10	PO 1,2

10	a	Write the method of aerodynamic control of Coaxial-rotor helicopter using AFCS.	Remember	CO 10	PO 1,2
	b	Distinguish Directional Airframe Coaxial-rotor Helicopter (CRH) and Symmetrical Airframe Coaxial-rotor Helicopter with the help of AFCS	Analyze	CO 10	PO 1,2

KNOWLEDGE COMPETENCY LEVELS OF MODEL QUESTION PAPER



Signature of Course Coordinator
 Dr. Praveen kumar Balaguri,
 AssociateProfessor

HOD, AE