

**INSTITUTE OF AERONAUTICAL ENGINEERING**

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech IV SEMESTER END EXAMINATIONS (REGULAR) - AUGUST 2023

Regulation: UG-20

UNMANNED AERIAL VEHICLES

Time: 3 Hours

(AERONAUTICAL ENGINEERING)

Max Marks: 70

Answer ALL questions in Module I and II**Answer ONE out of two questions in Modules III, IV and V****All Questions Carry Equal Marks****All parts of the question must be answered in one place only****MODULE – I**

1. (a) Compare a military aircraft and UAVs. State few line regarding the agility of the both.
[BL: Understand| CO: 1|Marks: 7]
- (b) List out the classifications of military UAVs and civilian drones. Classify the UAVs with respective landing, aerodynamics and weight.
[BL: Understand| CO: 1|Marks: 7]

MODULE – II

2. (a) Summarize about flapping wing UAV with a pictorial representation. And discuss the various mechanism of flapping wing UAV.
[BL: Understand| CO: 2|Marks: 7]
- (b) Give a detail explanation of rotary wing UAV system and write the advantages, disadvantages, and applications.
[BL: Understand| CO: 2|Marks: 7]

MODULE – III

3. (a) Describe in detail the different types of MAVs. Give any two possible forms of airframes for MAVs with necessary examples.
[BL: Understand| CO: 3|Marks: 7]
- (b) Write a short note on following terms: i) Low aerodynamic drag, ii) High disposable load fraction for long-endurance, long-range role UAV.
[BL: Understand| CO: 3|Marks: 7]
4. (a) Identify the effects of airspeed, altitude, aspect ratio and aircraft mass on performance of a HALE UAV.
[BL: Understand| CO: 4|Marks: 7]
- (b) Classify the three main concerns of the long-endurance, long-range role UAV designer. Explain in detail with the necessary diagram.
[BL: Understand| CO: 4|Marks: 7]

MODULE – IV

5. (a) Outline various radio frequencies for radio communication. Give the radio frequency spectra.
[BL: Understand| CO: 5|Marks: 7]
- (b) Identify the different ways of achieving communication between GCS and UAV, Explain in detail.
[BL: Understand| CO: 5|Marks: 7]
6. (a) How line of sight range can be calculated ? Mention the variables involved with necessary diagram.
[BL: Understand| CO: 5|Marks: 7]

(b) Explain in detail about GPS, instrument landing system, and microwave landing system.

[BL: Understand| CO: 5|Marks: 7]

MODULE – V

7. (a) How the wind effects on UAVs performance, stability and control? Plot the various aerodynamic conditions. [BL: Understand| CO: 6|Marks: 7]

(b) Distinguish the aerodynamic stability and aerodynamically neutral stability designs of HTOL aircraft. [BL: Understand| CO: 6|Marks: 7]

8. (a) Mention the techniques to control the convertible rotor aircraft during different flying conditions. Compare the stability and control aspects of SMR and CRH configurations.

[BL: Understand| CO: 6|Marks: 7]

(b) Discuss the principle of gyroscope, gyro horizon, turn and bank indicator, magnetic compass and directional gyroscope. [BL: Understand| CO: 6|Marks: 7]

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