



**B.E/B.TECH DEGREE EXAMINATIONS: APRIL /MAY 2024**

(Regulation 2018)

Fourth Semester

**AERONAUTICAL ENGINEERING**

U18AET4004: UAV System Design

**COURSE OUTCOMES**

- CO1: Discuss the configuration, performance parameters, and design aspects of unmanned aerial vehicle (UAV).
- CO2: Compare the sensors, payloads and actuators suitable for various UAVs.
- CO3: Explain the working of UAV propulsion systems.
- CO4: Discuss the communication and navigation systems in UAV.
- CO5: Explain the practical limitations in the design and development of an UAV.

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

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|--|-----|-------------------|
| 1. Summarize the parameters used in the selection of UAV systems.  | CO1 | [K <sub>2</sub> ] |
| 2. List out any four advanced applications that can be effectively solved by hybrid Unmanned Aerial Vehicles.        | CO1 | [K <sub>2</sub> ] |
| 3. What is the use of determining the aerodynamic pressures through sensors in drones?                               | CO2 | [K <sub>2</sub> ] |
| 4. Are all the coils in BLDC motor energized by battery through ESC? (Yes/No). Briefly justify your response.        | CO2 | [K <sub>3</sub> ] |
| 5. Write down the names and examples of payload classification based on digital data communication mode.             | CO2 | [K <sub>2</sub> ] |
| 6. Why the positioning of compressor and turbine blades are differently located in gas turbine engine system?        | CO3 | [K <sub>3</sub> ] |
| 7. Define Mission Planning and Control Station. List its functions.  | CO4 | [K <sub>2</sub> ] |
| 8. Specify the roles of different loops involved in the UAV's flight control system.                                 | CO5 | [K <sub>2</sub> ] |
| 9. How the principle of dead reckoning navigation is different from the principle of radio waves relayed navigation? | CO5 | [K <sub>2</sub> ] |
| 10. Enumerate the inertial sensors together with their purposes.   | CO5 | [K <sub>2</sub> ] |

**Answer any FIVE Questions:-**  
**PART B (5 x 16 = 80 Marks)**  
**(Answer not more than 400 words)**

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|-----|---|----|-----|-------------------|
| 11. | Explain in detail about the three design stages involved in the development of Unmanned Aerial Vehicles with neat block diagram.                          | 16 | CO1 | [K <sub>3</sub> ] |
| 12. | a) Write the name of real-time position sensor imposed in drone's BLDC motor and explain it's working principle.  | 8  | CO2 | [K <sub>4</sub> ] |
|     | b) What is a electronic speed controller? Using a neat block diagram, explain in detail the major functioning principles and important parts.             | 8  | CO2 | [K <sub>4</sub> ] |
| 13. | a) Explain in detail about the procedures involved in the design process of payloads assembly in UAV with neat flowchart.                                 | 12 | CO2 | [K <sub>3</sub> ] |
|     | b) How scientific payloads are unique from other conventional payloads? Name any two scientific payloads.   | 4  | CO2 | [K <sub>3</sub> ] |
| 14. | a) Explain in detail about the working principle, components and their operating procedures of a Gas Turbine Engine.                                      | 12 | CO3 | [K <sub>3</sub> ] |
|     | b) Differentiate the radial engine from the rotary engine.  | 4  | CO3 | [K <sub>3</sub> ] |
| 15. | a) Why do UAVs need communication systems? Describe the key components, classifications, and operational principles of it.                                | 8  | CO4 | [K <sub>3</sub> ] |
|     | b) Are navigation systems necessary for UAV's mission execution? Provide a comprehensive explanation of their classifications and significant components. | 8  | CO4 | [K <sub>3</sub> ] |
| 16. | a) Describe the two major flight control modes available in UAVs.   | 8  | CO4 | [K <sub>4</sub> ] |
|     | b) Compare and contrast the principles and working procedures involved in Global Positioning System (GPS) with Differential GPS.                          | 8  | CO4 | [K <sub>4</sub> ] |

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