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Question Paper Code: AAEB45



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - DECEMBER 2022

Regulation: R18

## AVIONICS AND INSTRUMENTATION

Time: 3 Hours

(AERONAUTICAL ENGINEERING)

Max Marks: 70

Answer FIVE Questions choosing 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) Sketch the MIL-STD-1553B multiplex data bus architecture and explain the bus protocol. [BL: Understand| CO: 1|Marks: 7]  
(b) Explain the nature of microelectronic devices with suitable sketches and use of microelectronics in the aviation field. [BL: Understand| CO: 1|Marks: 7]
- (a) What do you understand by integrated modular avionics? Describe any three types of flight deck instruments in brief. [BL: Understand| CO: 1|Marks: 7]  
(b) Describe the importance of electronics in aviation industry in current scenarios with few suitable examples. [BL: Understand| CO: 1|Marks: 7]

### MODULE – II

- (a) Illustrate the working of magnetic sensors micro electromechanical systems with a neat sketch. [BL: Understand| CO: 2|Marks: 7]  
(b) Describe the requirement of sensors in avionics and air data sensor in detail with required examples. [BL: Understand| CO: 2|Marks: 7]
- (a) List and discuss various instrument used via inertial sensing and discuss about direction Gyro. [BL: Understand| CO: 2|Marks: 7]  
(b) Elaborate how accurate are inertial navigation systems? Differentiate between inertial navigation system and inertial reference system. [BL: Understand| CO: 4|Marks: 7]

### MODULE – III

- (a) How does inertial navigation system work? Summarize aircraft communications, addressing and reporting system (ACARS). [BL: Understand| CO: 3|Marks: 7]  
(b) Calculate the slant range given by the distance measuring equipment for the following data. Ground distance from the DME ground station is 10 nmi (nautical miles) and the distance from the ground is 1nmi. Also, find the height of the aircraft from the ground if the value displayed by the DME is 6.1nmi and the ground distance of the aircraft from the DME ground station is 6nmi. [BL: Apply| CO: 3|Marks: 7]
- (a) Outline the principle used in global positioning system for the calculation of position and three GPS segments in detail. [BL: Understand| CO: 4|Marks: 7]

- (b) Interpret the following [BL: Apply| CO: 2|Marks: 7]
- i) Identify the location of the aircraft with respect to the VOR Omni station and explain VOR display shown in Figure 1.

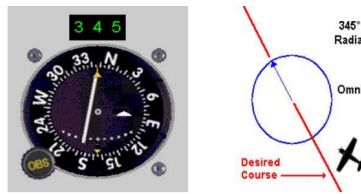


Figure 1

- ii) Locate the aircraft with respect to the VOR Omni station and identify the current and radial aircraft flying location as shown in Figure 2.



Figure 2

#### MODULE – IV

7. (a) Write the advantages of flight management system. Demonstrate the information that a navigation database contains for building a flight plan. [BL: Understand| CO: 5|Marks: 7]
- (b) List out automatic direction finders. Differentiate between the radio navigation system and Inertial navigation system. [BL: Understand| CO: 5|Marks: 7]
8. (a) What is air-to-air refueling? Describe probe-and-drogue system and flying boom system used for air refueling. [BL: Understand| CO: 5|Marks: 7]
- (b) Mention the frequency range of operation, accuracy limits, benefits and drawbacks of a tactical air navigation system. [BL: Apply| CO: 5|Marks: 7]

#### MODULE – V

9. (a) Demonstrate the avionics supplement precision flight controls and set the avionics console on a flat surface. [BL: Understand| CO: 6|Marks: 7]
- (b) Outline the frequency range of operation of a radar and its principle of working. What are surface movement and en-route surveillance radars? [BL: Understand| CO: 6|Marks: 7]
10. (a) Illustrate the aircraft axis movement in relation with aircraft attitude with a neat sketch. [BL: Understand| CO: 6|Marks: 7]
- (b) Summarize the elements of a spacecraft's attitude determination and control system using a concise block diagram. [BL: Understand| CO: 6|Marks: 7]