Hall Ticket No | | | | | | | | | | |  Question Paper Code: AAE525

# INSTITUTE OF AERONAUTICAL ENGINEERING

**(Autonomous)**

**Dundigal, Hyderabad - 500 043**

## MODEL QUESTION PAPER-II

B. Tech VIII Semester End Examinations, April/May – 2020

**Regulations: IARE - R16**

## AVIONICS AND INSTRUMENTATION

(Aeronautical Engineering)

**Time: 3 hours** **Max. Marks: 70**

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

### UNIT – I

| | | | |
|---|---|---|---|
| 1. | a) | Determine the Requirements of avionics equipment and systems? Explain the typical data transaction of MIL-STD 1553B? | **[7M]** |
| | b) | Draw the Topology of MIL-STD-1553B and ARINC629 Data buses? | **[7M]** |
| 2. | a) | Describe the architecture of A-529 data buss with neat sketch indicating word format and its applications | **[7M]** |
| | b) | Elaborate the integration of a typical Attitude Detection Indicator to the Flight display. | **[7M]** |

### UNIT – II

| | | | |
|---|---|---|---|
| 3. | a) | What do you understand by Air Data and Inertial Reference Systems (ADIRS) Name the various instrument used via inertial sensing? Briefly discuss Direction Gyro? | **[7M]** |
| | b) | Discuss the basic principle of VHF communication and draw the block diagram of VHF Transmitter. | **[7M]** |
| 4. | a) | Explain the MHRS? Explain the air stream direction and detector (ADD)? | **[7M]** |
| | b) | What is inertial sensing and explain the uses of inertial sensing? Explain the Position Gyroscopes with neat sketch? | **[7M]** |

### UNIT – III

| | | | |
|---|---|---|---|
| 5. | a) | What are Care free maneuvering characteristics? Define code tracking loop. | **[7M]** |
| | b) | Define Fiber Optic Gyro with a schematic representation Infer the various inertial sensor systems used in aircraft? | **[7M]** |
| 6. | a) | Explain vulnerability of Avionics system. And also Explain and expand CERVIT. | **[7M]** |
| | b) | Explain the various radio frequency spectrum used in aviation and show the letter designation for various frequencies? | **[7M]** |

### UNIT – IV

| | | | |
|---|---|---|---|
| 7. | a) | Illustrate in detail about Terrain Awareness and Warning System (TAWS) and Explain the Flight control requirements? | **[7M]** |
| | b) | Differentiate the objectives of Air Traffic Management in navigation, ranging and landing systems? | **[7M]** |

| | | | |
|---|---|---|---|
| 8. | a) | Interpret the Autopilot Flight Director Systems (AFDS) in aircraft systems. | **[7M]** |
| | b) | Explain how the ILS approach is use full in bad weather condition? Explain the B777 air data and inertial reference system? | **[7M]** |

**UNIT – V**

| | | | |
|---|---|---|---|
| 9. | a) | Explain the Airbus model of FBW system? Explain the aircraft axis movement in relation with aircraft attitude? | **[7M]** |
| | b) | Explain how modern design techniques help in designing SAS (Stability Augmentation System) as well as autopilots. | **[7M]** |
| 10. | a) | Differentiate the navigation requirement between civil and military aviation. | **[7M]** |
| | b) | Discuss the needs of air-to-air refueling for military aircraft in surveillance systems and auto-flight systems. | **[7M]** |

## COURSE OBJECTIVES:

**The course should enable the students to:**

| S. No | Description |
|---|---|
| I | Impart the knowledge in various types of Avionics systems, its components & its applications in aerospace industries. |
| II | Offer a rigorous avionics technology, Review of the basic system integration and the different type of avionics architectures. |
| III | Provide necessary knowledge to study the aircraft instrumentation sensors, displays and different type of sensors |
| IV | Give knowledge about military aircraft adaptation, avionics and mission system interface and gives the difference between civilian aircraft avionics and military aircraft avionics |

## COURSE OUTCOMES (COs):

| | |
|---|---|
| CO 1 | Describing aviation technology, bus systems and few basics of aircraft systems |
| CO 2 | Differentiating aircraft instrumentation - sensors and displays systems |
| CO 3 | Understanding communication systems and navigation aids |
| CO 4 | Estimation of military aircraft adaptation mission system interface, navigation and flight management |
| CO 5 | Acquiring knowledge on airborne radar, astrionics, avionics for spacecraft |

## COURSE LEARNING OUTCOMES (CLOs):

**Students, who complete the course, will have demonstrated the ability to do the following:**

| | |
|---|---|
| AAE525.01 | Understanding the different avionics bus systems |
| AAE525.02 | Interpret the need of bus systems in avionics |
| AAE525.03 | Constructing the integrating modular avionics architectures, shelf systems and avionics packaging systems |
| AAE525.04 | Understanding the concept of sensing system in aircraft instrumentation system. |
| AAE525.05 | Development of different types of indication systems |
| AAE525.06 | Constructing different display systems in instrumentation system |
| AAE525.07 | Developing the concept of different communication system |
| AAE525.08 | Understanding different navigation systems, global and local area augmentation |
| AAE525.09 | Understanding flight management system control and display unit |
| AAE525.10 | Measuring of avionic and mission system interface, navigation and flight management |
| AAE525.11 | Arranging airborne early warning, ground surveillance |
| AAE525.12 | Explanation of electro-optics and the infra-red |
| AAE525.13 | Characterizing of types of radar- pulse Doppler |
| AAE525.14 | Determination Attitude and control of spacecraft, magnetometers |
| AAE525.15 | Construction of command and telemetry in aviation technology |

## MAPPING OF SEMESTER END EXAMINATION TO COURSE OUTCOMES

| SEE Question No | | Course Learning Outcomes | | Course Outcomes | Blooms Taxonomy Level |
|---|---|---|---|---|---|
| 1 | a | AAE525.01 | Understanding the different avionics bus systems | CO 1 | Understand |
| | b | AAE525.02 | Interpret the need of bus systems in avionics | CO 1 | Understand |
| 2 | a | AAE525.02 | Interpret the need of bus systems in avionics | CO 1 | Remember |
| | b | AAE525.03 | Constructing the integrating modular avionics architectures, shelf systems and avionics packaging systems | CO 1 | Understand |
| 3 | a | AAE525.04 | Understanding the concept of sensing system in aircraft instrumentation system | CO 2 | Remember |
| | b | AAE525.05 | Development of different types of indication systems. | CO 2 | Remember |
| 4 | a | AAE525.06 | Constructing different display systems in instrumentation system. | CO 2 | Understand |
| | b | AAE525.07 | Developing the concept of different communication system | CO 2 | Understand |
| 5 | a | AAE525.08 | Understanding different navigation systems, global and local area augmentation | CO 3 | Remember |
| | b | AAE525.08 | Understanding different navigation systems, global and local area augmentation | CO 3 | Understand |
| 6 | a | AAE525.09 | Understanding flight management system control and display unit | CO 3 | Understand |
| | b | AAE525.10 | Measuring of avionic and mission system interface, navigation and flight management | CO 3 | Remember |
| 7 | a | AAE525.11 | Arranging airborne early warning, ground surveillance | CO 4 | Understand |
| | b | AAE525.12 | Explanation of electro-optics and the infra-red | CO 4 | Understand |
| 8 | a | AAE525.11 | Arranging airborne early warning, ground surveillance | CO 4 | Remember |
| | b | AAE525.13 | Characterizing of types of radar- pulse Doppler | CO 4 | Understand |
| 9 | a | AAE525.14 | Determination Attitude and control of spacecraft, magnetometers | CO 5 | Remember |
| | b | AAE525.15 | Construction of command and telemetry in aviation technology | CO 5 | Understand |
| 10 | a | AAE525.14 | Determination Attitude and control of spacecraft, magnetometers | CO 5 | Remember |
| | b | AAE525.14 | Determination Attitude and control of spacecraft, magnetometers | CO 5 | Understand |

**Signature of Course Coordinator** **HOD, AE**