INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - DECEMBER 2022
Regulation: R18
AUTOMATIC CONTROL OF AIRCRAFT

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

1. (a) Explain the influence of aircraft state nomenclature indicating all fast and slow states of the airplane. [BL: Understand| CO: 1|Marks: 7]

   (b) Demonstrate with suitable sketch about the preset guidance, celestial guidance and terrestrial guidance used for the application of the air navigation and guidance system.

   [BL: Understand| CO: 1|Marks: 7]

2. (a) Write about gyroscopic precision used in navigation system. Differentiate between active and passive homing of the missile guidance system. [BL: Understand| CO: 1|Marks: 7]

   (b) Illustrate the aircraft homing system and discuss each element of the this system with it's operating principle. [BL: Understand| CO: 1|Marks: 7]

MODULE – II

3. (a) Describe overall control system of the aircraft with necessary sketch and explain the functions of each element. [BL: Understand| CO: 2|Marks: 7]

   (b) Relate gain scheduling control design approach by combining linear parameters-varying control theory. [BL: Understand| CO: 2|Marks: 7]

4. (a) Mention the contribution of different aircraft flight controls to obtain control augmentation with suitable diagram. [BL: Understand| CO: 2|Marks: 7]

   (b) Categorize the ten components related to flight control system and explain three of them with their functions and principles. [BL: Understand| CO: 2|Marks: 7]

MODULE – III

5. (a) Outline the root locus for conventional transport and autopilot with suitable graph showing all necessary parameters. [BL: Understand| CO: 3|Marks: 7]

   (b) Identify the flight path stabilization system for the complete longitudinal control system. Write the transfer functions and show in the Mach hold mode of the flight control system.

   [BL: Understand| CO: 3|Marks: 7]

6. (a) How many degrees of freedom does an aircraft have? Differentiate between control power of rudder and aileron by using proper diagram. [BL: Understand| CO: 4|Marks: 7]

(b) Compare the relationship between phugoid with short period approximation methods to find dynamic characteristics of the aircraft system. Give the reasons for differing these two methods.

[BL: Understand| CO: 4|Marks: 7]

MODULE – IV

7. (a) Summarize the damping of the Dutch roll of the aircraft during flight. How Lateral autopilot is helpful to counter this effect? [BL: Understand| CO: 5|Marks: 7]

(b) Analyze the response of an aircraft using the rudder coordination computer to achieve necessary coordination for a pulse aileron deflection with suitable graphs and diagram.

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

8. (a) Infer closed loop flight control systems and how this system is used for the automation system?

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

(b) Discuss the working of the autopilot and show all the components of the autopilot and its working to make the aircraft automated. [BL: Understand| CO: 5|Marks: 7]

MODULE – V

9. (a) Show the purpose of the beam director and Laser cooling system on fly by optics system on the modern aircraft? [BL: Understand| CO: 6|Marks: 7]

(b) Determine all the aircraft parameters that effects the stability of an airplane. Write the required equations and explain each term. [BL: Apply| CO: 6|Marks: 7]

10. (a) Interpret the flight control law design features for the aircraft as well as industry requirement.

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

(b) Outline the fly by wire design issues control algorithm choice and discuss details about this system. [BL: Understand| CO: 6|Marks: 7]

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