Hall Ticket No. | | | | | | | | | | | Question Paper Code: AAE018

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-II

B.Tech VIII Semester End Examinations, April - 2020

Regulations: R16

FLIGHT CONTROL THEORY

(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)	List the advantages & disadvantages of positive feedback control systems?	[7M]
	b)	Discuss the purpose and functioning of various filters used in control Systems and how is overall system stability determined?	[7M]
2.	a)	Functionally, how do closed-loop systems differ from open-loop system? Also give three examples of open loop systems.	[7M]
	b)	Discuss modeling and transfer function of different filters used in aircraft control	[7M]

UNIT – II

3.	a)	Briefly discuss impulse response and indicial response in terms of time frequency performance.	[7M]
	b)	Explain about the different types of transducers and sensors used in control system?	[7M]
4.	a)	Find the poles and zeros of a control system whose transfer function is given by $G(s) = (s+3)/ (s^2+7s+12)$	[7M]
	b)	Transfer function of a control system is $s/((s+1)(s+2))$. Find the response for the unit step input.	[7M]

UNIT – III

5.	a)	Discuss steady state and transient specifications of a second order system and first order system.	[7M]
	b)	List the examples of first order systems with the help of transient state equation and explain it.	[7M]
6.	a)	Define and discuss the purpose of gain scheduling in the controller and its specifications to control the gain.	[7M]
	b)	With the suitable examples Differentiate the first order system from second order system in control theory?	[7M]

UNIT – IV

7.	a)	Discus the relationship between flying qualities and aircraft transfer function.	[7M]
	b)	Explain the role of rate feedback in stability augmentation system with the help of neat sketch and its importance.	[7M]

8. a) Explain how approximate aircraft transfer function is obtained from control systems [7M]
   b) Briefly explain the role of displacement and rate feedback in the design of stability augmentation system. [7M]

UNIT – V

9. a) Explain about the concept of state space modeling of dynamical systems with the block diagram? [7M]
   b) List the properties for the numerical solution of state equations and state variables. [7M]

10. a) Discuss the advantages of digital control system over analog control system and its usage. [7M]
    b) What is controllability? How do you test the controllability of a system in the modern control systems? [7M]

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COURSE OBJECTIVES:

The course should enable the students to:

I	Apply stability criteria to determine the stability of an aircraft, and specify the aircraft time-domain and frequency-domain response specifications.
II	Understand Classical control theory in the frequency domain and modern control theory in the state- space are effectively mixed to provide the student with a modern view of systems theory.
III	Design control techniques for aircraft control systems, and study some feedback control applications.
IV	Study the controllability and observability of aerospace systems, and apply the modern control techniques to design enhanced flight control systems.

COURSE OUTCOMES (COs):

CO 1	Describe the analysis techniques for classical control theory to nonlinear system
CO 2	To describe and analyze the physical system with inherent non-linearity for stability and performance.
CO 3	Provide knowledge on various adaptive schemes, with a basic understanding on closed loop system stability and implementation issues.
CO 4	Describe the principle of approximations to aircraft transfer functions, control surface actuators-review. response of aircraft to elevator input, response of aircraft to rudder input and response of aircraft to aileron input to atmosphere
CO 5	Define reversible and irreversible flight control systems. flying qualities of aircraft-relation to airframe transfer function. pilot's opinion ratings. flying quality requirements- pole-zero, frequency response and time- response specifications

COURSE LEARNING OUTCOMES (CLOs):

AAE018.01	Define the basic concepts associated with Control Theory and its application.
AAE018.02	Review Fourier Transform with mathematical operations and its applications.
AAE018.03	Review Laplace Transform and some other important mathematical operations.
AAE018.04	Understand about the concepts of Transfer function, its merits and applications.
AAE018.05	Understand the control system performance with the time domain description.
AAE018.06	Analyze the steady state response and application of feedback in augmentation controls.
AAE018.07	Understand the control system performance with the frequency domain description.
AAE018.08	Analyze an aircraft's performance to controls and related aspects.
AAE018.09	Evaluate an aircraft's performance from the control point of view as a system.
AAE018.10	Determine the Approximations to aircraft transfer functions.
AAE018.11	Understand about stability augmentation systems for an aircraft with autopilot system.
AAE018.12	Determine the Flying qualities of aircraft and requirements.

AAE018.13	Understand about the concepts of feedback control its merits and applications.
AAE018.14	Understand the concept of control surface actuators and its usage in aircraft applications.
AAE018.15	Determine the Displacement and rate feedback determination of gains conflict with pilot inputs resolution

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No		Course Learning Outcomes		Course Outcomes	Bloom's Taxonomy Level
1	a	AAE018.01	Define the basic concepts associated with Control Theory and its application.	CO1	Understand
	b	AAE018.01	Define the basic concepts associated with Control Theory and its application.	CO1	Remember
2	a	AAE018.02	Review Fourier Transform with mathematical operations and its applications.	CO1	Understand
	b	AAE018.03	Review Laplace Transform and some other important mathematical operations.	CO1	Remember
3	a	AAE018.04	Understand about the concepts of Transfer function, its merits and applications.	CO2	Understand
	b	AAE018.05	Understand the control system performance with the time domain description.	CO2	Understand
4	a	AAE018.06	Analyze the steady state response and application of feedback in augmentation controls.	CO2	Remember
	b	AAE018.06	Analyze the steady state response and application of feedback in augmentation controls.	CO2	Understand
5	a	AAE018.07	Understand the control system performance with the frequency domain description.	CO3	Remember
	b	AAE018.07	Understand the control system performance with the frequency domain description.	CO3	Understand
6	a	AAE018.08	Analyze an aircraft's performance to controls and related aspects.	CO3	Remember
	b	AAE018.09	Evaluate an aircraft's performance from the control point of view as a system..	CO3	Understand
7	a	AAE018.10	Determine the Approximations to aircraft transfer functions.	CO4	Remember
	b	AAE018.11	Understand about stability augmentation systems for an aircraft with autopilot system.y.	CO4	Understand
8	a	AAE018.11	Understand about stability augmentation systems for an aircraft with autopilot system.	CO4	Remember
	b	AAE018.12	Determine the Flying qualities of aircraft and requirements.	CO4	Understand
9	a	AAE018.13	Understand about the concepts of feedback control its merits and applications.	CO5	Understand
	b	AAE018.14	Understand the concept of control surface actuators and its usage in aircraft applications.	CO5	Remember
10	a	AAE018.15	Determine the Displacement and rate feedback determination of gains conflict with pilot inputs resolution	CO5	Understand
	b	AAE018.15	Determine the Displacement and rate feedback determination of gains conflict with pilot inputs resolution	CO5	Remember

Signature of Course Coordinator **HOD, AE**