Hall Ticket No | | | | | | | | | | | Question Paper Code: AAE017

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-II

B.Tech VII Semester End Examinations, November/December – 2019

Regulations: IARE - R16

FLIGHT VEHICLE DESIGN

(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)	Write about the over view of the design process with design wheel sketch?	**[7M]**
	b)	Discuss airfoil aerodynamic characteristics of 6 digit NACA airfoils. Use good sketches. Discuss in particular (Cl_{max}) versus t/c (thickness to chord ratio).	**[7M]**
2.	a)	Describe wing vertical location for the fuselage with one example. What are the different shapes of wing tips with the neat sketches?	**[7M]**
	b)	Explain Thrust-Matching Requirements? Explain the comparison of selected engines thrust available during cruise to estimated aircraft.	**[7M]**

UNIT – II

3.	a)	What is producibility, maintainability? Explain Special considerations in configuration layout from conceptual sketch	**[7M]**
	b)	Explain briefly about visual delectability and aural signature	**[7M]**
4.	a)	Describe the important properties to the selection of material for an aircraft?	**[7M]**
	b)	What is lofting definition? Explain briefly about flat wrap lofting?	**[7M]**

UNIT – III

5.	a)	What are the factors include aircraft fuel system with fuel tank volume plotting?	**[7M]**
	b)	What are the two different types of air loads explain in detail with v-n diagrams?	**[7M]**
6.	a)	Explain the landing gear arrangements for multi-wheel main landing gear with neat sketch? and also Explain landing gear arrangements for tail dragger, quadric-cycle, and multi-bogey	**[7M]**
	b)	Describe the more common forms of shock absorber types? Explain about oleo shock absorber.	**[7M]**

UNIT – IV

7.	a)	Derive the equation for static lateral, directional stability and trim	**[7M]**
	b)	Derive sustained turn-rate of the aircraft and also explain the turn rate and corner speed with the graphical representation.	**[7M]**
8.	a)	What is Cooper - Harper scale? What is the minimum thrust required for level flight?	**[7M]**
	b)	Explain energy maneuverability methods of optimal climb trajectories and turns.	**[7M]**

UNIT – V

9.	a)	Describe latest version of the Development and Procurement Costs of Aircraft (DAPCA) model	**[7M]**
	b)	What are the methods of improved conceptual sizing? What is cost estimating method, RDT&E and production costs?	**[7M]**
10.	a)	Explain take-off, climb and acceleration, cruise and loiter with the following expressions	**[7M]**
	b)	Explain carpet plot matrix and how carpet plot," is based upon superimposing the takeoff weight plots from Sizing matrix cross plots.	**[7M]**

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COURSE OBJECTIVES:

The course should enable the students to:

S. No	Description
I	Discuss the importance of conceptual design process and studying different phases of design process involved in the design
II	Understand the levels of integrated product development and principles of the baseline design-stability & control, performance and constraint analysis
III	Analyze cost estimation, parametric analysis, optimization, and refined sizing and trade studies
IV	Observe different designing processes and how an aircraft production company works on it.

COURSE OUTCOMES (COs):

CO 1	Describe different phases of aircraft design , weight estimation and few basics of aerodynamics
CO 2	Differentiating size estimation fuel system and understanding the installation of engine systems
CO 3	Estimation of lift curve slopes maximum lift coefficient and different material selection can be found
CO 4	Understanding the concepts of stability for different control surfaces and also understanding the methods of structural analysis
CO 5	Acquiring knowledge on cost estimation research, Development, Test, and Evaluation and product cost for designing an aircraft

COURSE LEARNING OUTCOMES (CLOs):

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

AAE017.01	Understanding the different designing concepts like preliminary design conceptual design and detail deign
AAE017.02	Interpret the weight estimation of propulsion system structural weight empty weight
AAE017.03	Calculating the dimensioning of engine inlet location and capture area
AAE017.04	Estimation of wing geometry and wing vertical location, wing tip shapes, tail geometry and arrangements, thrust to weight ratio-statistical estimation
AAE017.05	Apply a theories and to predict the maximum lift coefficient, and complete drag build up, installed performance of an engine
AAE017.06	Development of configuration lay out from conceptual sketch.
AAE017.07	Calculating the velocity, angle of Attack, angle of attack rate, pitch rate, elevator angle.
AAE017.08	Constructing v-n diagram, air load distribution on lifting surfaces
AAE017.09	Developing the concept of Propulsion selection fuel selection.
AAE017.10	Plotting the mission segment with different weight fractions
AAE017.11	Understanding the concepts of different landing gear system
AAE017.12	Estimation of design-stability and control

AAE017.13	Analysis of performance under constrained conditions constraint
AAE017.14	Acquire Basic knowledge to solve real time problems in Aircraft propulsion and structure with different loading conditions
AAE017.15	Apply the fundamental concepts in competitive examinations

MAPPING OF SEMESTER END EXAMINATION TO COURSE OUTCOMES

SEE Question No		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	AAE017.01	Understanding the different designing concepts like preliminary design conceptual design and detail deign	CO 1	Understand
	b	AAE017.02	Interpret the weight estimation of propulsion system structural weight empty weight.	CO 1	Understand
2	a	AAE017.02	Interpret the weight estimation of propulsion system structural weight empty weight	CO 1	Remember
	b	AAE017.03	Calculating the dimensioning of engine inlet location and capture area	CO 1	Understand
3	a	AAE017.04	Estimation of wing geometry and wing vertical location, wing tip shapes, tail geometry and arrangements, thrust to weight ratio-statistical estimation	CO 2	Remember
	b	AAE017.05	Apply a theories and to predict the maximum lift coefficient, and complete drag build up, installed performance of an engine	CO 2	Remember
4	a	AAE017.06	Development of configuration lay out from conceptual sketch.	CO 2	Understand
	b	AAE017.07	Calculating the velocity, angle of Attack, angle of attack rate, pitch rate, elevator angle.	CO 2	Understand
5	a	AAE017.08	Constructing v-n diagram, air load distribution on lifting surfaces	CO 3	Remember
	b	AAE017.08	Constructing v-n diagram, air load distribution on lifting surfaces	CO 3	Understand
6	a	AAE017.09	Developing the concept of Propulsion selection fuel selection	CO 3	Understand
	b	AAE017.10	Plotting the mission segment with different weight fractions	CO 3	Remember
7	a	AAE017.11	Understanding the concepts of different landing gear system	CO 4	Understand
	b	AAE017.12	Estimation of design-stability and control	CO 4	Understand
8	a	AAE017.11	Understanding the concepts of different landing gear system	CO 4	Remember
	b	AAE017.13	Analysis of performance under constrained conditions constraint	CO 4	Understand
9	a	AAE017.14	Acquire Basic knowledge to solve real time problems in Aircraft propulsion and structure with different loading conditions	CO 5	Remember
	b	AAE017.15	Apply the fundamental concepts in competitive examinations	CO 5	Understand
10	a	AAE017.14	Acquire Basic knowledge to solve real time problems in Aircraft propulsion and structure with different loading conditions	CO 5	Remember
	b	AAE017.14	Acquire Basic knowledge to solve real time problems in Aircraft propulsion and structure with different loading conditions	CO 5	Understand

Signature of Course Coordinator **HOD, AE**