Introduction to Aircraft Design
July-2023

Assignment 1

Q 1	Read the following statements and choose the correct option: I. Initial Sizing and Layout is carried out in the Conceptual Design Phase. II. Performance estimation is carried out in the Preliminary Design Phase. III. Cost estimation is carried out in the Detailed Design Phase.	
MCQ (1 mark)	(A)	All statements are correct.
	(B)	Only I is correct.
	(C)	Only II is correct.
	(D)	Only III is correct.
	(E)	Both I and II are correct.
	(F)	Both I and III are correct.
	(G)	Both II and III are correct.
	(H)	All statements are incorrect.
Solution: (B)		

Q 2	Which of the following regulatory body is responsible for the certification of military aircraft in India?	
MCQ (1 mark)	(A)	DGCA
	(B)	HAL
	(C)	CEMILAC
	(D)	FAA
Solution: (C)		

Q 3	Which of the following ususally drive the the Customer's specifications?	
MSQ (1 mark)	(A)	Operational requirements
	(B)	Technological developments
	(C)	Safety requirements
	(D)	Uniformity and standardization of flight data
Solution: (A), (B)		

Q 4	Which of the following statement(s) is/are TRUE about the process of Aircraft Design for a Civil transport aircraft?	
MSQ (1 mark)	(A)	It doesn't include sensitivity analysis.
	(B)	It is an iterative process.
	(C)	It results in a unique solution.
	(D)	It is an example of concurrent engineering.
Solution: (B), (D)		

Q 5	What was/were the reason(s) for the untimely retirement of Boeing 727 airliner?	
MSQ (1 mark)	(A)	High fuel consumption.
	(B)	High noise levels.
	(C)	High maintenance cost.
	(D)	Several accidents.
Solution: (A), (B), (C)		

Q 6	Which of the following statement(s) is/are TRUE about Life Cycle Cost?	
MSQ (1 mark)	(A)	The slope of the “locked in curve” is the same for all types of aircraft.
	(B)	There is high potential for cost overruns in the concept exploration phase.
	(C)	There is no cost involved in the concept exploration phase.
	(D)	It is the main driver of the design process in modern times.
Solution: (D)		

Q 7	Read the following statements and choose the correct option: I. Complexity in the aircraft conceptual design process brings out the best outcome. II. We should always start from scratch to design a new aircraft, to avoid any bias. III. There are no unique solutions in aircraft conceptual design.	
MCQ (1 mark)	(A)	All statements are correct.
	(B)	Only I is correct.
	(C)	Only II is correct.
	(D)	Only III is correct.
	(E)	Both I and II are correct.
	(F)	Both I and III are correct.
	(G)	Both II and III are correct.
	(H)	All statements are incorrect.
Solution: (D)		

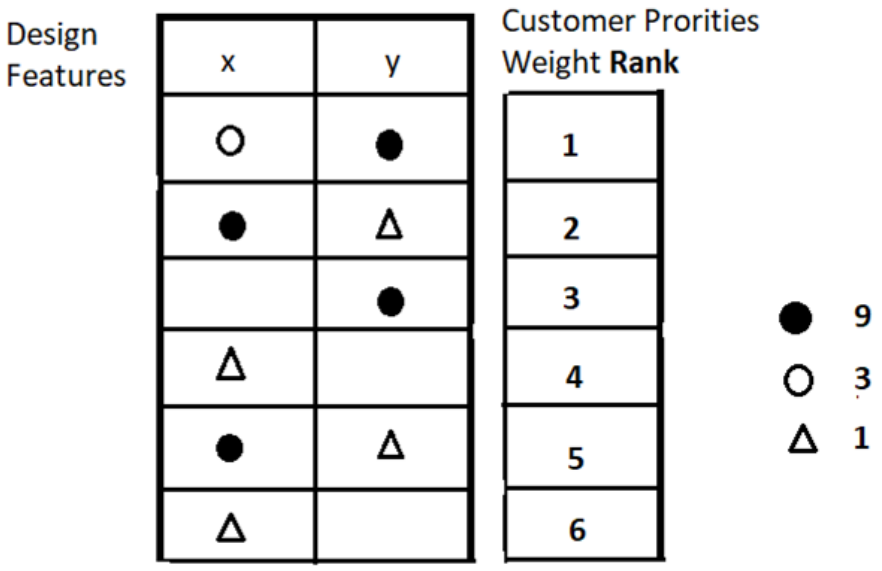
Q 8	What is the significance of Requirements Capture in aircraft design process?	
MSQ (1 mark)	(A)	To understand exactly what the Customer wants.
	(B)	To understand priorities of the Customer's needs.
	(C)	To do the comparative analysis of a competitor's design.
	(D)	To identify desirable features in the design.
Solution: (A), (B), (C), (D)		

Q 9	Which of the following is/are typical Customer Attributes for a transport aircraft?	
MSQ (1 mark)	(A)	Low fuel consumption
	(B)	Passenger comfort
	(C)	Large Baggage space
	(D)	Low Maintenance Cost
Solution: (A), (B), (C), (D)		

Q 10	Which of the following is/are TRUE about a typical House of Quality (HoQ) chart?	
MSQ (1 mark)	(A)	Design Features are mentioned in the left portion of HoQ.
	(B)	Design Correlation Matrix is provided on the top of HoQ.
	(C)	Customer Needs are mentioned in the right portion of the HoQ.
	(D)	Design Feature Priorities are mentioned in the bottom portion of HoQ.
Solution: (B), (D)		

Q 11	Which of the following is the correct sequence of Clausing Four-Level QFD Model?	
MCQ (1 mark)	(A)	House of Quality → Process Planning → Production Planning → Parts Deployment
	(B)	Parts Deployment → House of Quality → Process Planning → Production Planning
	(C)	House of Quality → Parts Deployment → Process Planning → Production Planning
	(D)	Process Planning → Production Planning → Parts Deployment → House of Quality
Solution: (C)		

Q 12	Which of the following is/are TRUE about *Global Hawk* UAV?	
MSQ (1 mark)	(A)	It is a HALE UAV.
	(B)	It has high aerodynamic efficiency.
	(C)	It has a low Aspect Ratio wing.
	(D)	It is powered by a single Turbojet engine.
Solution: (A), (B)		

Q 13 - 15	The weightage for the six needs of a customer are as follows:- 0.06, 0.15, 0.08, 0.16, 0.35, and 0.22. A part of HoQ is shown in the image. 

Q 13	Calculate the Design Feature Priority value for the design feature “x”. (Write your answer correct upto two decimal places)
NAT (1 mark)	Answer Range : 3.96
Solution: $x = (0.35 * 3) + (0.22 * 9) + (0.15 * 1) + (0.08 * 9) + (0.06 * 1) = 3.96$	
Q 14	Calculate the design feature priority value for the design feature “y”. (Write your answer correct upto two decimal places)
NAT (1 mark)	Answer Range : 4.89
Solution: $y = (0.35 * 9) + (0.22 * 1) + (0.16 * 9) + (0.08 * 1) = 4.89$	

Q 15	Which of the two Design Features has higher priority?	
MCQ (1 mark)	(A)	x
	(B)	y
	(C)	Both the design features have equal priorities.
	(D)	Insufficient information to arrive at a decision.
Solution: (B)		