Name: **Enrolment No:**	

UPES
End Semester Examination, May 2023

Course: Aircraft Design **Semester: VIII**
Program: B. Tech Aerospace Engineering **Time 03 hrs.**
Course Code: ASEG 4004 **Max. Marks: 100**
Instructions: Use of Design DATA is permitted. Assume *appropriate* value for missing DATA

SECTION A
(5Qx4M=20Marks)

S. No.		**Marks**	**CO**
Q 1	List airworthiness requirements of business Jet Aircraft	**04**	**CO1**
Q 2	Compare different types Landing gears used in aircraft..	**04**	**CO2**
Q 3	Why staging is important for Launch vehicle?	**04**	**CO4**
Q 4	Derive expression for gross take-off weight of aircraft.	**04**	**CO3**
Q 5	Give expression for orbital velocity of launch vehicle considering all losses.	**04**	**CO5**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Classify different types of seating arrangement used in aircraft. How it affects fuselage design? (provide neat sketches)	**10**	**CO1**
Q 7	Obtain payload trade study of transport aircraft having following features: *Payload weight=4000 kg; Estimated fuel fraction=0.381; Empty Weight fraction=*$0.85W_0^{-0.07}$.	**10**	**CO2**
Q 8	An airplane has cruise velocity 300 m/s, wing loading-80 kg/m^2; take-off weight=1000 kg. Also, design same Wing when Cruise velocity 100 m/s. Design the main Wing that would be suitable for this aircraft.	**10**	**CO3**
Q 9	Compare overall *payload mass* to *initial to mass* ratio for serial and parallel *multi-stage* Launch Vehicles. Proved expressions for each case. **OR**	**10**	**CO5**

	Consider 2 stage launch vehicle with 1300 m^3 required volume. Estimate stage length, if stage diameter is 6m, 7 m, 8m and 10 m for single stage.		
SECTION-C **(1Qx40M=40 Marks)**			
Q 10	Design an 2 trainer aircraft with following requirements: Maximum level speed at mid cruise 400 Km/hr Range: 1500km Ceiling: 6000 meter Rate of climb at sea level 250 m/min Stalling speed: 100 Km/hr Landing distance 700 m Takeoff distance 800 m Airplane should be powered by one conventional reciprocating engine Given Mission profile as: (provide three view sketches with Dimension of aircraft including Wing, Tail, fuselage, landing gears, Tires, etc.) **OR** For an aircraft of 180+capacity, the conventional seating (mixed class) would be five abreast for economy and four abreast for business, with a single aisle. For our executive layout, four abreast would be sensible. Design this aircraft with following performance requirements. Maximum level speed at mid cruise 450 Km/hr Range: 8000km Ceiling: 10000 meter Rate of climb at sea level 100 m/min Stalling speed: 100 Km/hr Landing distance 1800 m Takeoff distance 1800 m Airplane should be powered by one conventional reciprocating engine Given Mission profile as: (provide three view sketches with Dimension of aircraft including Wing, Tail, fuselage, landing gears, Tires, etc.)	**40**	**CO4**