U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Aerospace Engineering **Duration: 3 hrs.**
Course Code: 22AS3PCIAE **Max Marks: 100**
Course: Introduction to Aerospace Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	CO	PO	Marks
1	a)		Explain the primary, secondary and auxiliary control surfaces on an aircraft.	CO1	PO1	**8**
	b)		Calculate the standard atmosphere values of T, P and ρ at an altitude of 18 km.	CO3	PO3	**8**
	c)		Define a Mach number. Mention its different ranges.	CO2	PO1	**4**
			OR			
2	a)		Explain different layers of standard atmosphere and also describe the temperature and pressure variation in different regions of atmosphere with suitable sketches.	CO1	PO1	**10**
	c)		Enumerate the spacecraft classification and also give its detailed explanation with a suitable example for each type.	CO 1	PO 1	**10**
			UNIT - II			
3	a)		Estimate the lift-off distance for the CJ-1 at sea level. Assume a paved runway: μ_r = 0.02. During the ground roll, the angle of attack of the airplane is restricted by the requirement that the tail not drag the ground; so assume that $C_{L,max}$ during ground roll is limited to 1.0. Also, when the airplane is on the ground, the wings are 6 ft above the ground. Assume wingspan is 53.5ft, wing area is 318ft^2, normal gross weight is 19,815lb, fuel capacity is 1119 gal of kerosene, specific fuel consumption is 0.6 lb of fuel, two turbofan engines of 3650 lb thrust each at sea level, $C_{D,0}$ is 0.02,e is 0.81 and air density is 0.002377 slug/ft^3.	CO2	PO	**6**
	b)		What do you understand by V-n diagram? Explain in detail.	CO2	PO2	**4**
	c)		Derive the equation for landing ground roll distance (S_L).	CO2	PO1	**10**
			OR			
4	a)		List out the factors that affect lift of an aircraft and also give detailed explanation for each factor with suitable diagrams.	CO2	PO3	**10**

		b)	How does an aerofoil produce a lift? Explain.	*CO1*	*PO1*	**4**
		c)	Explain different types of drag and derive the expression for Induced drag.	*CO3*	*PO3*	**6**
			UNIT - III			
	5	a)	Explain the Performance characteristics of the different propulsion systems in terms of altitude–airspeed envelopes.	*CO1*	*PO1*	**4**
		b)	A jet propulsion unit, with turbojet engine, having a forward speed of 1,100 km/hr produces 14 KN of thrust and uses 40 kg of air per second. Find i) the relative exist jet velocity, ii) the thrust power, iii) the propulsive power and iv) the propulsive efficiency.	*CO2*	*PO3*	**8**
		c)	With the help of neat sketch explain the working of turbojet engine. Also give its advantages and disadvantages over other gas turbine engines.	*CO2*	*PO2*	**8**
			OR			
	6	a)	Derive the thrust equation of a Jet Engine.	*CO1*	*PO1*	**8**
		b)	What do you understand by dynamic stability? Explain its types with the help of suitable sketches	*CO1*	*PO1*	**6**
		c)	Consider a turbojet-powered airplane flying at a standard altitude of 30,000 ft at a velocity of 500 mi/h. The turbojet engine itself has inlet and exit areas of 7 and 4.5 ft^2, respectively. The velocity and pressure of the exhaust gas at the exit are 1600 ft/s and 640 lb/ft^2, respectively. At a standard altitude of 30,000ft, p_∞ =629.66lb/ft^2 and ρ_∞=8.9068x10^{-4}. Calculate the thrust of the turbojet.	*CO2*	*PO3*	**6**
			UNIT - IV			
	7	a)	List the uses of i) Aluminium alloys ii) Titanium iii) Stainless Steel iv) Composite Materials	*CO1*	*PO1*	**8**
		b)	Differentiate truss type and semi-monocoque type of fuselage construction.	*CO1*	*PO1*	**6**
		c)	Explain the wing structure of an aircraft with the help of a neat sketch.	*CO1*	*PO1*	**6**
			OR			
	8	a)	With the help of neat sketches describe the monocoque, truss and semi-monocoque type of fuselage construction.	*CO1*	*PO1*	**10**
		b)	Explain about metallic and non-metallic materials used for aircraft.	*CO1*	*PO1*	**10**

			UNIT - V			
	9	a)	What are the different types of key space concepts and key counter space concepts? Explain each one of its kind in detail.	*CO3*	*PO2*	**8**
		b)	Explain the emerging technology trends in aviation industry.	*CO3*	*PO2*	**5**
		c)	Mention the top aerospace companies in India and their role.	*CO2*	*PO1*	**7**
			OR			
	10	a)	Define Crashworthiness. Explain in detail about crashworthy systems.	*CO 3*	*PO 3*	**8**
		b)	Explain the emerging technologies in aircraft manufacturing.	*CO 3*	*PO 3*	**6**
		c)	Explain the challenges faced in aerospace engineering.	*CO 3*	*PO 3*	**6**

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