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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: 23AS3PCIAE **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)		Enumerate the spacecraft classification and also give its detailed explanation with a suitable example for each type.	*CO1*	*PO1*	**8**
	b)		With the help of a suitable block diagram, list and explain the major components of a spacecraft.	*CO1*	*PO1*	**6**
	c)		Give the definition of an altitude by using suitable figure.	*CO1*	*PO1*	**6**
			OR			
2	a)		Explain the different layers of atmosphere with a graph showing the temperature and pressure variation.	*CO1*	*PO1*	**6**
	b)		Calculate the standard atmosphere values of T, p and ρ at an altitude of 18 km.	*CO3*	*PO3*	**10**
	c)		Define Reynold's number and its value for a laminar flow in a closed tube.	*CO1*	*PO1*	**4**
			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.	*CO3*	*PO3*	**8**
	b)		Derive the equation for landing ground roll distance (S_L).	*CO2*	*PO3*	**8**

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		c)	With the help of suitable sketches, explain the nomenclature of an aerofoil. How are aerofoils are designated in NACA 4-digit system.	*CO1*	*PO1*	**4**
			OR			
	4	a)	Estimate the landing ground roll distance at sea level for the CJ-1. No thrust reversal is used; however, spoilers are employed so that L= 0. The spoilers increase the zero lift drag coefficient by 10 percent. The fuel tanks are essentially empty, so neglect the weight of any fuel carried by the airplane. The maximum lift coefficient, with flaps fully deployed at touchdown, is 2.5. Assume that the empty weight of the CJ-1 is 12,352 lb, $C_{D,0}$ is 0.02, μ_r = 0.4, wing area is 318ft^2, air density is 0.002377 slug/ft^3.	*CO3*	*PO3*	**6**
		b)	List out the factors that affect lift of an aircraft and also give detailed explanation for each factor with suitable diagrams.	*CO2*	*PO1*	**8**
		c)	Derive the expression to find out the length of ground roll required for a lift-off (S_{LO}).	*CO2*	*PO3*	**6**
			UNIT - III			
	5	a)	With the help of cycle of operation, T-S diagram and P-V diagram, explain the working principle of Brayton cycle.	*CO1*	*PO1*	**8**
		b)	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.	*CO3*	*PO3*	**6**
		c)	With the help of neat sketch explain the working of a liquid and solid propellent engines.	*CO1*	*PO1*	**6**
			OR			
	6	a)	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.	*CO3*	*PO3*	**8**
		b)	Derive the thrust equation of a Jet Engine.	*CO3*	*PO3*	**6**
		c)	With the help of neat sketch explain the working of turbojet engine.	*CO1*	*PO1*	**6**
			UNIT - IV			
	7	a)	Explain the wing structure of an aircraft with the help of a neat sketch.	*CO1*	*PO1*	**7**

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		b)	Explain briefly the semi-monocoque construction of a fuselage.	*CO1*	*PO1*	**7**
		c)	Explain about metallic and non-metallic materials used for aircraft.	*CO1*	*PO1*	**6**
			OR			
	8	a)	List the uses of i) Aluminium alloys ii) Titanium iii) Stainless Steel iv) Composites	*CO1*	*PO1*	**12**
		b)	Explain the truss type construction of a fuselage.	*CO1*	*PO1*	**4**
		c)	Differentiate semi-monocoque type and monocoque type of fuselage construction.	*CO1*	*PO1*	**4**
			UNIT - V			
	9	a)	Explain the emerging technology trends in aviation industry.	*CO1*	*PO1*	**7**
		b)	What are the different types of key space concepts and key counterspace concepts? Explain each one of its kind in detail.	*CO1*	*PO1*	**8**
		c)	Define Crashworthiness. Explain in detail about crashworthy systems.	*CO3*	*PO2*	**5**
			OR			
	10	a)	Explain the emerging technologies in aircraft manufacturing.	*CO3*	*PO2*	**7**
		b)	Mention the top aerospace companies in India and their role.	*CO2*	*PO1*	**6**
		c)	Mention and define the challenges being faced by the aerospace industry with growing technology.	*CO2*	*PO1*	**7**

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