Model Question Paper -1 with effect from 2020-21(CBCS Scheme)

USN | | | | | | | | | | |

Fifth Semester B.E. Degree Examination

Aerospace Propulsion

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module – 1	Marks
Q.1	(a)	Explain classification of power plants in Aircraft and Space Propulsion system	10
	(b)	An aircraft propeller flies at a speed of 450 kmph. The diameter of the propeller is 4.1m and the speed ratio is 0.79. The ambient conditions of air the flight altitude are T=255K and ρ = 0.55 bar. Find the following i) Thrust ii) Thrust Power iii) Propulsion efficiency.	10
		OR	
Q.2	(a)	Explain about the turbofan Engine with clear diagram and its Advantages & Disadvantages	10
	(b)	Explain about Methods of Thrust augmentation	10
		Module – 2	
Q.3	(a)	Explain with neat sketch working principle of Liquid Propellant rocket engine with pump feed system and its advantages and disadvantages	10
	(b)	Explain working principle of Hybrid rocket engine with neat sketch and its advantages and disadvantages	10
		OR	
Q.4	(a)	Explain working principle of geometries of Hall thrusters with neat sketch and its advantages and disadvantages	10
	(b)	A Rocket flies at a speed of 20000kmph with an effective exhaust jet velocity of 1400 m/s and the heat produced by the propellant is 7000 kJ/kg. If the propellant flow rate is 5.4 kg/s. Determine i) Propulsive efficiency ii) Propulsion power iii) Engine output iv) Overall efficiency.	10
		Module – 3	
Q.5	(a)	Explain about types of propellants and Propellant tanks.	10
	(b)	Explain about rocket engines for maneuvering and orbit adjustments	10

		OR	Marks
Q.6	(a)	Explain about the propellant properties and liquid Oxidizers	6
	(b)	Explain about Liquid monopropellants and Gaseous Propellants	7
	(c)	Explain about combustion instability	7
		Module – 4	
Q.7	(a)	Explain about propellant grain stress and strain	10
	(b)	Explain about Propellant hazards and methods for preventing dangerous situation.	10
		OR	
Q.8	(a)	Explain with neat Sketch propellant manufacturing process flow for a rocket motor.	10
	(b)	Explain about Acoustic instabilities	10
		Module – 5	
Q.9	(a)	Write short notes on i) Under and Overexpanded Nozzles	6
	(b)	Explain about the influence of Chamber geometry.	7
	(c)	Explain about Losses in Real Nozzle and compare to an Ideal Nozzle.	7
		OR	
Q.10	(a)	Explain about Factors Influencing Injector Behavior	7
	(b)	Explain about Loads and Stresses in Thrust Chamber Wall	7
	(c)	Write short note on Integration with vehicle.	6

Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome				
Question		**Bloom's Taxonomy Level attached**	**Course Outcome**	**Programme Outcome**
Q.1	(a)	L2	CO1	PO1,PO3,P12
	(b)	L3	CO1	PO1,PO2,PO3
	(c)			
Q.2	(a)	L2	CO1	PO1,PO3,P12
	(b)	L2	CO1	PO1,PO3,P12
	(c)			
Q.3	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)			
Q.4	(a)	L2	CO3	PO1,PO3,P12
	(b)	L3	CO3	PO1,PO2,PO3
	(c)			
Q.5	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)			
Q.6	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)	L2	CO3	PO1,PO3,P12
Q.7	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)			
Q.8	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)			
Q.9	(a)	L2	CO2	PO1,PO3,P12
	(b)	L2	CO2	PO1,PO3,P12
	(c)	L2	CO2	PO1,PO3,P12
Q.10	(a)	L2	CO2	PO1,PO3,P12
	(b)	L2	CO2	PO1,PO3,P12
	(c)	L2	CO2	PO1,PO3,P12

Bloom's Taxonomy Levels	**Lower order thinking skills**		
	Remembering(knowledge):L_1	Understanding Comprehension): L_2	Applying (Application): L_3
	Higher order thinking skills		
	Analyzing (Analysis): L_4	Valuating (Evaluation): L_5	Creating (Synthesis): L_6

Model Question Paper -2 with effect from 2020-21(CBCS Scheme)

USN | | | | | | | | | | |

Fifth Semester B.E. Degree Examination

Aerospace Propulsion

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module – 1	Marks
Q.1	**(a)**	Explain the following performance parameter of Aircraft propulsion with definition: i) Thrust ii)Specific fuel consumption iii) Propulsive efficiency iv) Specific Impulse v)Thermal efficiency	10
	(b)	Write down the Factors affecting thrust and power.	10
		OR	
Q.2	**(a)**	Explain about the turboprop Engine with clear diagram and its Advantages & Disadvantages	10
	(b)	With a neat sketch, explain the construction and working principle of Ramjet Engine	10
		Module – 2	
Q.3	**(a)**	Explain classification of Space Propulsion system	5
	(b)	Explain working principle of Hybrid rocket engine with neat sketch and its advantages over due other two types chemical rockets	10
	(c)	Discuss the Rocket reacting principle and Thrust equation	5
		OR	
Q.4	**(a)**	Explain working principle of geometries of Ion thrusters with neat sketch and its advantages and disadvantages	10
	(b)	Explain working principle of beam/plume characteristics with neat sketch	10
		Module – 3	
Q.5	**(a)**	Explain with neat sketch working principle of Liquid Propellant rocket engine with gas pressure feed system and its advantages and disadvantages	10
	(b)	Compare helium to nitrogen gas when used for pressurizing a propellant tank with 250 kg of 90% hydrogen peroxide by estimating their required mass and volume. The pressurizing tank is initially at a gas pressure p0 of 14 MPa and the required propellant final tank pressure pp is 3.40 MPa. The density of this liquid propellant is 1388 kg/m3 and the ambient temperature is 298 K. Assume pg ≈ pp together with ideal flow conditions so that we may use well-known expressions for isentropic and isothermal expansions	10

		OR	Marks
Q.6	(a)	Explain about Safety and Environmental Concerns	6
	(b)	Explain about the propellant properties and liquid Fuels	7
	(c)	Explain about combustion process	7
		Module – 4	
Q.7	(a)	Explain about propellant grain and grain configuration	10
	(b)	Explain about attitude control and Side maneuvers with Solid Propellant Rocket Motors.	10
		OR	
Q.8	(a)	Write short notes on i) Liners ii) Insulators and Inhibitors	8
	(b)	Explain about Ignition Process.	6
	(c)	Explain about Vortex-Shedding Instability.	6
		Module – 5	
Q.9	(a)	A rocket propulsion system operates near sea level with a chamber pressure of $P_1 = 2.068$ MPa , a chamber temperature of $1949\ ^{\circ}C$, and a propellant consumption of $\dot{m} = 1.0$ kg/sec. Take k = 1.30 and R = 345.7 J/kg − K. Calculate the ideal thrust and the ideal specific impulse. Also plot the cross-sectional area A, the local velocity v, the specific volume V, the absolute temperature T, and the local Mach number M with respect to pressure along the nozzle.	10
	(b)	Explain with neat sketch of different generic nozzle configuration and their flow effects.	5
	(c)	Write short note on Nozzle Alignment.	5
		OR	
Q.10	(a)	Explain about Starting and Ignition of Thrust chamber.	10
	(b)	Explain with neat sketch of any Five Thrust Vector control Mechanisms.	5
	(c)	With neat sketch explain about Thrust Vector Control with multiple nozzles for fight maneuvers.	5

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	(b)	L2	CO1	PO1,PO3,P12
	(c)			
Q.2	(a)	L2	CO1	PO1,PO3,P12
	(b)	L2	CO1	PO1,PO3,P12
	(c)			
Q.3	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)	L2	CO3	PO1,PO3,P12
Q.4	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)			
Q.5	(a)	L2	CO3	PO1,PO3,P12
	(b)	L3	CO3	PO1,PO2
	(c)			
Q.6	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)	L2	CO3	PO1,PO3,P12
Q.7	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)			
Q.8	(a)	L2	CO3	PO1,PO3,P12
	(b)	L2	CO3	PO1,PO3,P12
	(c)	L2	CO3	PO1,PO3,P12
Q.9	(a)	L3	CO2	PO1,PO2
	(b)	L2	CO2	PO1,PO3,P12
	(c)	L2	CO2	PO1,PO3,P12
Q.10	(a)	L2	CO2	PO1,PO3,P12
	(b)	L2	CO2	PO1,PO3,P12
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