BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH **SEMESTER : III**
BRANCH: ALL **SESSION : MO/2025**

SUBJECT: SR510 FUNDAMENTALS OF AEROSPACE ENGINEERING

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**

			CO	BL
Q.1(a)	List down the devices which exclusively make use of the application of Bernoulli's Equation. Sketch the devices and explain the working principle of the same.	[5]	CO1	L3
Q.1(b)	Explain the lift curve slope of an infinite aerofoil specifying the characteristics of the aerofoil on it. Also show the difference of its characteristics comparing with a finite aerofoil.	[5]	CO1	L2
Q.2(a)	Show the graphical representation of an infinitesimal sounding particle travelling at a speed more than its propagation of sound. Thus define the zone of action, zone of silence and three dimensional envelop it creates. Also quantitatively find the value of the angle between the envelop and the horizontal.	[5]	CO2	L3
Q.2(b)	List down the salient features of the deflection angle, wave angle, and Mach number curve obtained by plotting the implicit relation between them for an oblique shock.	[5]	CO2	L3
Q.3(a)	Define jet propulsion with an example.	[2]	CO3	L2
Q.3(b)	What is the function of a compressor in a turbojet engine? What is the principle on which it works?	[3]	CO3	L3
Q.3(c)	What is the difference between a ramjet and a scramjet engine with suitable sketches? Also write the challenges associated with scramjet engine over ramjet engine.	[5]	CO3	L4
Q.4(a)	What is the significance of burn rate index (n) given in the burn rate equation of a solid rocket motor?	[2]	CO4	L2
Q.4(b)	What are the ingredients used in a double base solid propellant? Also give the reasons why it is also called homogenous propellant.	[3]	CO4	L3
Q.4(c)	Explain with suitable figure the pump feed arrangement used in a staged combustion cycle of a liquid rocket engine.	[5]	CO4	L4
Q.5(a)	Write the Law of Equal Area that is followed in the planetary motion of the space.	[2]	CO5	L2
Q.5(b)	Derive the equation for the universal law of gravitational force with suitable sketch.	[3]	CO5	L3
Q.5(c)	Derive the equation for the orbital velocity and also show how it changes with the altitude?	[5]	CO5	L4

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