

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

**CLASS: MTECH
BRANCH: ALL**

**SEMESTER : III
SESSION : MO/2024**

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.
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		CO	BL
Q.1(a)	Describe the aerofoil characteristics operated at various angles of attack. Also illustrate the 4-digit NACA aerofoil series with a typical example.	[5] CO1	L2
Q.1(b)	Differentiate between the compressible Vs incompressible flows, Viscous Vs Inviscid flows. Provide typical example cases with explanation where such flows could be assumed.	[5] CO1	L3
Q.2(a)	Explain the formation of normal shock wave in any example situation. How does the Prandtl's relation help understand the flow across a normal shock wave.	[5] CO2	L2
Q.2(b)	Describe in brief the chart containing the deflection angle, wave angle and the Mach number for solution to an oblique shock wave. You could take different cases and obtain the influence on the other.	[5] CO2	L3
Q.3(a)	What is sfc and write its significance in term of practical application point of view?	[2] CO3	L2
Q.3(b)	In a thrust augmentation method of using afterburner, why sfc is seen to increase relatively more than the thrust?	[3] CO3	L3
Q.3(c)	What is the difference between a turboprop and a turboshaft engine? Explain it with suitable sketches.	[5] CO3	L4
Q.4(a)	Write the burning rate equation for the solid rocket motor.	[2] CO4	L2
Q.4(b)	What are the various ingredients used in a composite solid propellant? Also write the function of each.	[3] CO4	L3
Q.4(c)	Explain the combustion mechanism of a hybrid rocket motor with suitable sketch.	[5] CO4	L4
Q.5(a)	Write the law of ellipse that is used for the planetary motion in space.	[2] CO5	L2
Q.5(b)	What do you mean by universal law of gravitational force? Explain it with suitable equation and sketch.	[3] CO5	L3
Q.5(c)	Derive the equation for escape velocity and also show how it is linked to the orbital velocity?	[5] CO5	L4

:19/11/2024:E