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

CLASS: M.TECH   SEMESTER : III
BRANCH: ALL   SESSION : MO/2023

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)	Summarize the differences between Laminar and Turbulent flows.		[5]	CO1	L2
Q.1(b)	Describe the Reynolds experiment and detail the process to find the laminar and turbulent flows.		[5]	CO1	L2
Q.2(a)	In the area-velocity relation, with various operating cases describe the corresponding shapes which are acting as nozzles, diffusers and combination of them.		[5]	CO2	L2
Q.2(b)	Illustrate the deflection angle and wave angle curve for oblique shocks for a typical supersonic Mach number.		[5]	CO2	L2
Q.3(a)	What do you mean by Jet Propulsion? Explain with an example.		[2]	CO3	L2
Q.3(b)	Why turboprop engine cannot be operated above a certain altitude? Also write the components that produces thrust in this engine.		[3]	CO3	L3
Q.3(c)	Explain in brief about the working principles of a scramjet engine? Also write its major challenges associated with it.		[5]	CO3	L4
Q.4(a)	Draw the TS diagram of solid rocket propulsion?		[2]	CO4	L2
Q.4(b)	What is the function of a curing agent? Give an example of the curing agent used in solid rocket propellant preparation.		[3]	CO4	L3
Q.4(b)	Explain clearly with suitable sketches about the significance of burning rate exponent (n). Also show on the same figure the plateau burning and explain about it.		[5]	CO4	L4
Q.5(a)	Write about the law of harmonics?		[2]	CO5	L2
Q.5(b)	Explain in brief about the Universal Law of Gravitational Force.		[3]	CO5	L3
Q.5(c)	Derive an equation to obtain the centrifugal force ($m\omega^2 R$) that balances the object in its orbit.		[5]	CO5	L4

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