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

CLASS: MTECH **SEMESTER : II**
BRANCH: SER **SESSION : SP/2025**

SUBJECT: SR551 SOLID ROCKET PROPULSION

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)	What are the drawbacks of using a cylindrical port grain for solid rocket applications?	[2]	CO1	L2
Q.1(b)	What do you mean by a dual thrust grain? Explain it with an example and suitable figures.	[3]	CO1	L3
Q.1(c)	How the combustion of a composite propellant take place? Explain it with suitable sketches. Also explain how its combustion behavior is expected to change with the change in operating pressure.	[5]	CO1	L4
Q.2(a)	What are the merits of using a movable nozzle over a fixed nozzle in a solid rocket motor?	[2]	CO2	L2
Q.2(b)	What are the main materials generally used in the nozzle construction? Show it on the simple nozzle sketch.	[3]	CO2	L3
Q.2(c)	Derive the equation for exit velocity and also show that the maximum possible exit velocity through nozzle is only dependent on the combustion chamber temperature.	[5]	CO2	L4
Q.3(a)	Why metals are preferred in the solid rocket propellant?	[2]	CO3	L2
Q.3(b)	How the combustion of metal takes place in a composite solid propellant? Explain in brief.	[4]	CO3	L4
Q.3(c)	How the erosive burning is different from the normal burning of a solid propellant? Explain in brief.	[4]	CO3	L4
Q.4(a)	Why extinction information is so important for solid rocket propulsion? Explain any two methods that are extensively used for the extinction of the solid propellant.	[5]	CO4	L4
Q.4(b)	Why thrust vector control is required in rocket applications? Explain any two methods utilized in solid rocket application.	[5]	CO4	L4
Q.5(a)	Why longitudinal wave of instability is considered not so dangerous?	[2]	CO5	L3
Q.5(b)	What are the various possibilities that could be utilized for the reduction of acoustic instability of solid rocket motor?	[4]	CO5	L4
Q.5(c)	What is the function of an L* burner? Also write its working principle with suitable sketch.	[4]	CO5	L4

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