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

CLASS: M.Tech **SEMESTER : II**
BRANCH: SER **SESSION : SP/19**

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.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Derive the burn rate equation for the solid rocket by taking propellant as the double base propellant. Write all the assumptions made in the derivations. [6]

Q.1(b) Explain the combustion mechanism of the composite solid propellant grain with suitable sketches. Also explain the combustion and the flame behavior by taking the examples of two different particle sizes of the oxidizer. [4]

Q.2(a) Derive the specific impulse equation using the approximate thermodynamic relations. Also write all the assumptions made in this derivation. [5]

Q.2(b) Explain the procedure for getting the expansion conditions mainly the exit temperature for the frozen conditions. [5]

Q.3(a) Derive mass flow rate equations through the chocked flow nozzle. Write the significance of each term with respect to the rocket performance. [5]

Q.3(b) What are different types of materials used in the designing of a nozzle? Show it by taking the example of the nozzle. Also write the reasons for the selection of such materials. [5]

Q.4(a) What are different methods of extinction of solid rocket motor? Explain clearly one of them how it has been used in practical application. Also write their drawbacks from the practical point of view. [5]

Q.4(b) Explain clearly the pressure variations during the ignition with respect to the time. Also compare these variations with respect to two different sizes of solid rocket motors. [5]

Q.5(a) What are do you mean by acoustic instabilities? How it is different from other types of instabilities? Write a method by which it could be measured. [5]

Q.5(b) What are the main sources of instabilities in solid rocket motor? Write the various methods adopted to overcome these instabilities. [5]

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