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

CLASS: M.TECH **SEMESTER : III**
BRANCH: SER **SESSION : MO/19**

SUBJECT: SR605 CRYOGENIC 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) Give a brief history of cryogenic development from starting phase to the commercial development of cryogens such as oxygen, argon, and helium. [5]

Q.1(b) What are the applications of cryogenics in medical applications? Explain clearly how it has been implemented for each application. [5]

Q.2(a) Why storage vessel of cryogenic fluid is also called Dewar vessel? Explain clearly with suitable sketches the main components of a Dewar vessels. Also indicate the reasons for such selection of the components. [5]

Q.2(b) What are the different methods adopted to measure the pressure of the cryogenic fluids stored under high pressure? Explain the working mechanism of any one of them. [5]

Q.3(a) How the impinging stream resultant angle of the injector, effect the combustion performance of the rocket engine? Show it with suitable sketches and also provide the equation used for the same. [5]

Q.3(b) What are different turbopump drive arrangements utilized to run the turbine and the pumps. Also write merits over others. [5]

Q.4(a) What are the different classifications of the propellants used in the liquid rocket engines? Write their suitability and challenges associated with each type in the practical applications. Also provide your recommendations with reasons. [5]

Q.4(b) Define Geysering with reference to cryogenic propulsion system. Why Geysering is so challenging for the cryogenic rocket engine operation? Explain clearly the phenomenon of Geysering formations with suitable sketches. [5]

Q.5(a) What is performance map? What are the various parameters that are considered in defining a performance map? Also explain how it is being utilized in designing a practical cryogenic propulsion system. [5]

Q.5(b) What does the MCC system mean? How is this system different from the earlier technology? Also explain how this system has been used in the test facilities P5 for VULCAN rocket engine. [5]

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