

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

CLASS: M.Tech
BRANCH: SER

SEMESTER: II
SESSION: SP/19

SUBJECT: SR554 ADVANCED PROPULSION SYSTEM

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) Explain in detail the concept of Free radical propulsion system with suitable diagram. What are the benefits of this type of propulsion system as compared to electrostatic propulsion? [5]
- Q.1(b) Illustrate how does the pulse chemical rocket system mimic the defence mechanism of the bombardier beetle? What are benefits and demerits of utilization of the pulsed chemical rockets as compared to the traditional chemical rocket system? [5]
- Q.2(a) What is the various inlet designs used in a Scramjet engine? Describe with suitable diagrams. [5]
- Q.2(b) Describe the various performance parameters used for characterizing the scramjet inlets and analyze the importance of each of the parameters. [5]
- Q.3(a) What is radioactive decay? Differentiate between nuclear fission and nuclear fusion based on their process conditions, working principle and energy generation. [5]
- Q.3(b) Differentiate between the working of a solid core fission reactor and particle bed fission reactor. Explain using required schematic diagrams. [5]
- Q.4(a) Differentiate between the Arcjet and Resistojet types electro-thermal thrusters on the basis of their working principle. Also include the advantages and disadvantages of the two systems. [5]
- Q.4(b) What are the major drawbacks of the ion thruster? Justify how Hall effect overcomes these drawbacks. (Include required schematics for explanation) [5]
- Q.5(a) Analyze the difference between the chemical micropropulsion system and the electrostatic micropropulsion. Also include the advantages and disadvantages of the two systems. [6]
- Q.5(b) What is the working principle behind the MEMS-based subliming solid microthruster concept? What are benefits and limitations of such a system? [4]

:::::29/04/2019 M:::::