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

CLASS: ME   SEMESTER :
BRANCH: SER   SESSION : SP/22

SUBJECT: SR 580 Elements of Hypersonic Flight

TIME: FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 10 questions each of 5 marks and total 50 marks.
2. The missing data, if any, may be assumed suitably.
3. **Before attempting the question paper, be sure that you have got the correct question paper.**
4. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1   What do you understand by a Hypersonic Flow? How does it differ from the supersonic flows?   [5]

Q.2   Briefly explain the low density flows and its requirement for the hypersonic flow regime.   [5]

Q.3   For $M \rightarrow \infty$, derive the relation between P_2/P_1, T_2/T_1, and ρ_2/ρ_1.   [5]

Q.4   Briefly explain that why the newton's sine squared law is often used for the hypersonic flow over a flat   [5]

        plate.

Q.5   Using a neat diagram, explain the concept of centrifugal force correction to Newtonian theory for a   [5]

        hypersonic flow.

Q.6   Differentiate between an exact and approximate solution.   [5]

Q.7   What do you understand by a Hypersonic equivalence principle.   **[5]**

Q.8   Discuss the velocity – altitude map for reentry vehicles.   **[5]**

Q.9   Explain the concept of hypersonic transition.   [5]

Q.10   Discuss the concept of self-similar solution for a hypersonic flow.   [5]

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