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

CLASS: MTECH **SEMESTER : II**
BRANCH: AEROSPACE ENGINEERING **SESSION: SP/2025**

SUBJECT: SR525 MACHINE LEARNING FOR SPACE SCIENCES

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.

			CO	BL
Q.1(a)	Provide a formal definition of machine learning and decompose the following problems into necessary components of machine learning: (i) hill-climbing, (ii) aerofoil design optimization	[5]	1	5
Q.1(b)	Provide a flow diagram for model-driven prediction methods and apply it to decompose the problem of thermal mapping of a spacecraft.	[5]	1	5
Q.2(a)	Explain combinatorial explosion with an example from aerofoil design optimization problem.	[5]	2	5
Q.2(b)	Explain performance-centric approach with an example from aerofoil design optimization.	[5]	2	5
Q.3(a)	Identify a genetic algorithm (GA) strategy for the design optimization of a nozzle.	[5]	4	5
Q.3(b)	Provide functional formulae for the generation of initial population and randomly generate a population of 5 candidate designs for the same problem as in (a).	[5]	4	5
Q.4(a)	Identify a neural network strategy for the analysis of aeroelasticity problem of a wing.	[5]	2,3	5
Q.4(b)	Describe the strategy for the same problem with reference to (i) data conditioning and parameters, (ii) network architecture, and (iii) probable learning method	[5]	2,3	5
Q.5(a)	Describe a problem which could be solved independently by GA and ANN.	[5]	3,4	5
Q.5(b)	Explain the similarities and differences between GA and ANN strategies.	[5]	3,4	5

::::::26/04/2025::::::E