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

CLASS: MTech/Pre-PhD **SEMESTER : I**
BRANCH: PROD **SESSION : MO/2023**

SUBJECT: PE522 OPTIMIZATION TECHNIQUES

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)	A chemical factory produces a chemical from two materials, x and y. x can be purchased for INR 5 per ton and y can be purchased for INR 1 per ton. The manufacturer wants to determine the amount of each raw material required to reduce the cost per ton of product to a minimum. Formulate the problem as an optimization problem.	[4]	1	3
Q.1(b)	Develop an optimization problem to identify the smallest perimeter of a rectangle with area 100 m^2.	[6]	1	3
Q.2(a)	Write any FOUR basic assumptions of formulating a linear programming model and briefly discuss any FOUR methods for solving it.	[4]	2	2
Q.2(b)	Solve graphically the given linear programming problem. Minimize $Z = 3a + 5b$ Sub. to $-3a + 4b \leq 12$ $2a - 1b \geq -2$ $2a + 3b \geq 12$ $1a + 0b \geq 4$ $0a + 1b \geq 2$, both a and $b \geq 0$	[6]	2	3
Q.3	Identify optimal point (if any) for the following function. $f(x, y, z) = -9x^2 + 6xy - 2y^2 - 2xz - 2z^2$	[10]	3	4
Q.4	Use interval halving method to solve the following problem within the interval [0, 8]. (ϵ =0.1) $f(x) = x^3 + 7x - 5$	[10]	4	3
Q.5(a)	Write the pros and cons of applying metaheuristics over classical techniques for optimization. Explain how the Simulated Annealing (SA) proceeds in its search for the global optima by exhibiting higher diversification initially.	[4]	5	3
Q.5(b)	Describe the various steps and parameters for a genetic algorithm (GA) using a flow chart. Consider a TSP of six cities to illustrate the computational steps.	[6]	5	4

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