BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

CLASS: BTech **SEMESTER : VI**
BRANCH: ECE **SESSION : SP/2025**

SUBJECT: EC377 INTELLIGENT COMPUTING AND OPTIMIZATION

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Discuss the difference between two bracketing methods, i.e., the exhaustive search method and the bounding phase method.	[2]	1	2
Q.1(b)	Perform two iterations of the bounding phase method to bracket the minimum of the function $f(x) = x^2 - 3x - 20$, use $x_0 = 0$ and $\Delta = 1$.	[3]	2	3
Q.2(a)	Compare the Newton Raphson method and Bisection method for optimization.	[2]	1,2	
Q.2(b)	Minimize $f(x) = x^2 + \frac{16}{x}$ using Newton Raphson method assuming 1 as an initial solution UP to an accuracy of $\varepsilon = 0.1$.	[3]	2	3
Q.3(a)	Discuss the optimality criteria in multivariable optimization problem.	[2]	1	
Q.3(b)	Check for the optimality of the Himmel Blau function $f(\vec{x}) = \left(x_1^2 + x_2 - 11\right)^2 + \left(x_1 + x_2^2 - 7\right)^2$ at points $(0,0)$ and $(3,2)$.	[3]		4
Q.4(a)	What are the main components of Genetic Algorithm? How elitism affects the convergence in GA.	[2]	2	
Q.4(b)	Show only one iteration of solving the problem: Maximize $f(x)=x^2$, $0<x<31$ using Genetic algorithm. Consider an initial population size of 6, with rank selection and single point crossover.	[3]	1,2	4
Q.5(a)	Draw the flow chat for showing the working of Particle Swarm Optimization along with the velocity and position update equations.	[2]	1	1,2
Q.5(b)	What is meant by Pareto optimal solution? Give a graphical representation of Pareto optimal solution and Pareto optimal front. Give an example of real time problem where Mult objective optimization will be required to solve.	[3]	1,2	2,5

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