

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

**CLASS: BTECH
BRANCH: CSE**

**SEMESTER : IV
SESSION : SP/2025**

SUBJECT: CS351 NATURE INSPIRED COMPUTING

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
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		CO	BL
Q.1(a)	Distinguished the Decision variable and State variable	[2]	1 1
Q.1(b)	Explain the Local Maxima and Global Maxima with diagram.	[3]	1 2
Q.2(a)	Define the Population-Based and Single-Point Search Algorithms.	[2]	2 1
Q.2(b)	What is the difference between Discrete and Continuous domains in Evolutionary Algorithms?	[3]	2 2
Q.3(a)	Explain the infeasible solution in a two-dimensional decision space with diagram.	[2]	2 2
Q.3(b)	What is Number of Functional Evaluation (NFE)? Explain with suitable example.	[3]	2 3
Q.4(a)	Consider the following two parent solutions represented as strings of binary values (each representing a potential solution to a problem): <ul style="list-style-type: none">• Parent 1: 1011101010• Parent 2: 0110011101 You are tasked with performing a two-point crossover at positions 4 and 7.	[2]	3 3
Q.4(b)	In the genetic algorithms a chromosome is represented in Binary number. The strength of a chromosome in decimal form, x is given by $Sf(x) = (\sum(x))/(\sum f(x))$ where $f(x) = x^2$ The population is given by P where $P = \{ (01101), (11000), (01000), (10011) \}$ What is the strength of fitness of chromosome (10011)?	[3]	3 3
Q.5(a)	Distinguished the terms Genotype and Phenotype.	[2]	3 3
Q.5(b)	Solve the Maximization function $f(x) = x^2+3x+2$ subject to constraint that $1 < x < 20$ using Genetic Algorithm. Show only one iteration of solution, highlighting each step.	[3]	3 3

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