

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

**CLASS: BTECH  
BRANCH: CSE**

**SEMESTER : VI  
SESSION : SP/2025**

**SUBJECT: CS351 NATURE INSPIRED COMPUTING**

**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.
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		CO	BL
Q.1(a)	Discuss the basic concepts of optimization. Why is optimization important in engineering and scientific applications?	[5] 1	1
Q.1(b)	Define the key terminologies associated with meta-heuristic and evolutionary algorithms, such as population, fitness, mutation, crossover, and selection.	[5] 1	2
Q.2(a)	Differentiate between the application of evolutionary algorithms in discrete and continuous domains. Provide examples to illustrate your answer.	[5] 2,3	2
Q.2(b)	Describe the general structure or flow of an evolutionary algorithm. What are the key steps involved from initialization to termination?	[5] 2,3	2
Q.3(a)	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 the solution, highlighting each step	[5] 3,5	4
Q.3(b)	What are the different types of crossover methods in GA? Explain with example.	[5] 3,4	3
Q.4(a)	Explain the all steps of PSO algorithm with flow chart.	[5] 3,4	3
Q.4(b)	Explain the probabilistic transition rule for pheromone updating in ACO.	[5]	4
Q.5(a)	Solve the Travelling Salesman Problem with Honey Bee Mating Optimization (HBMO) algorithm with suitable data.	[5] 4,5	4
Q.5(b)	Write the Pseudo-code and flow chart of Bat Algorithm.	[5] 4,5	3

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