K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

April – May 2023
(M.Tech.) Program: Artificial Intelligence Scheme: II
Examination: FY Semester: II
Course Code: PCEC203 and Course Name: Bio-inspired Artificial Intelligence

Date of Exam: 19/6/2023 Duration: 2.5 Hours Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q 1	**Solve any six questions out of eight.**	**12**		
i)	Explain what you mean by bio-inspired computing.	2	CO1	U
ii)	Explain the concept of Genetic Algorithm.	2	CO2	U
iii)	Explain how pheromone value can affect the decision of best traversal path between in graph.	2	CO3	U
iv)	What are lessons of Artificial Immune system?	2	CO4	U
v)	Explain the concept of neighborhood topologies with example	2	CO5	U
vi)	Explain the motivation behind artificial bee colony optimization.	2	CO3	U
vii)	How GA can be helpful in vaccination development?	2	CO6	U
viii)	What is the purpose of Harmony search algorithm?	2	CO5	U
Q.2	**Solve any four questions out of six.**	**16**		
i)	Explain what is constraint satisfaction problem? Explain with example.	4	CO1	U
ii)	Explain various techniques of Selection in GA with examples.	4	CO2	U
iii)	Draw and discuss the flowchart of Ant colony optimization.	4	CO3	AP
iv)	Explain Negative selection method of Artificial immune system along with diagrammatic representation.	4	CO4	U

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v)	Explain the algorithm of Particle Swarm Algorithm.	4	CO5	U
vi)	Discuss the real time use of Artificial Bee Colony optimization.	4	CO6	AP
Q.3	**Solve any two questions out of three.**	**16**		
i)	Apply Multi-Objective optimization Problem (MOOP) on the given beam design problem. Two Decision Variable: D: diameter, L: Length Beam has to carry load P Contradictory Objective of the problem: Minimized weight and Minimize Deflection. F1: Min weight F2: Min End Deflection Consider appropriate function to calculate Weight and deflection along with diameter and Length.	8	CO1	AP
ii)	Apply Genetic Programming for the following constraints. Problem: "Plastic Can Collecting navigating robot" Grid space consist "HOLE" and "Plastic Can" Robot has Collect "plastic cans" without falling into "Hole" Objective: Without getting GAME OVER Collect Plastic Cans . Conditions: If (move East = CAN & Move North = Empty Grid) Then - > Move East else - > Move South	8	CO2	AP
iii)	Apply ANT COLONY OPTIMIZATION on following graph to decide best possible path from SOURCE 1 to DEST 3	8	CO3	AP

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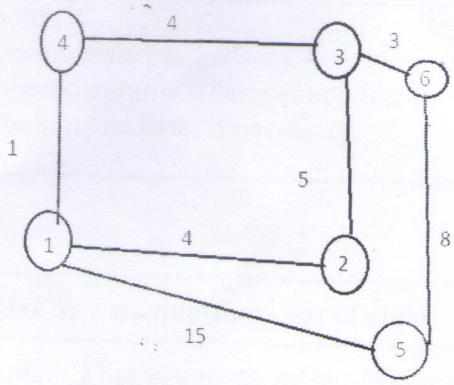

Consider PHEREMONE LEVEL for each link = 1

Q.4	**Solve any two questions out of three.**	**16**		
i)	Discuss Artificial Immune system with respect to Bio-logical behavior	8	CO4	AP
ii)	Apply Harmony Search Algorithm on following problem set, Given Harmony Memory size (HMAR) = 4 N(Musical Instruments) DIM: 3 Minimize Function $F(n) = X1^2 + (X2 - 1) + X3^2 + (X4-2)$ Find optimal solution for given harmony.	8	CO5	AP
iii)	Discuss Genetic Algorithm w.r.t. intrusion detection system.	8	CO6	AP

	X1	X2	X3
1	1	2	3
2	4	2	5
3	1	3	3
4	4	1	5