

Faculty of Engineering and Technology			
Ramaiah University of Applied Sciences			
Department	Computer Science and Engineering	Programme	B. Tech. in CSE- Summer
Semester/Batch	7/2018		
Course Code	19CSE422A	Course Title	Computational Intelligence
Course Leader	Dr. Vaishali R. Kulkarni and Dr. Monika Ravishankar		

Assignment-1					
Reg.No.			Name of Student		
Sections	Marking Scheme			Marks	
				Max Marks	First Examiner Marks
Part A	Part A				
	A1	Steps in Genetic algorithm with respect to a given problem	03		
	A2	Software Simulation with sample input and output	07		
		Part-A Max Marks	10		
Part B					
	B.1	Justification that the recommended algorithm is the best fit to the challenge	03		
	B.2	Discussion on the biological inspiration for the recommended algorithm	03		
	B.3	Software Simulation with sample input and output	07		
	B.4	Conclusion	02		
		Part- B Max Marks	15		
Total Assignment Marks			25		

Course Marks Tabulation				
Component-1 (B) Assignment	First Examiner	Remarks	Moderator	Remarks
A				
B				
Marks (out of 25)				

Please note:

1. Documental evidence for all the components/parts of the assessment such as the reports, photographs, laboratory exam / tool tests are required to be attached to the assignment report in a proper order.
2. The First Examiner is required to mark the comments in RED ink and the Second Examiner's comments should be in GREEN ink.
3. The marks for all the questions of the assignment have to be written only in the **Component – CET B: Assignment** table.
4. If the variation between the marks awarded by the first examiner and the second examiner lies within +/- 3 marks, then the marks allotted by the first examiner is considered to be final. If the variation is more than +/- 3 marks, then both the examiners should resolve the issue in consultation with the Chairman BoE.

Assignment

Instructions to students:

1. The assignment consists of **2** questions: Part A and Part B.
2. Maximum marks are **25**.
3. The assignment must be neatly word processed as per the prescribed format.
4. The maximum number of pages should be restricted to **10**.
5. The printed assignment must be submitted to the course leader.
6. **Submission Date: 25th Nov 2021**
7. **Submission after the due date is not permitted.**
8. **IMPORTANT:** It is essential that all the sources used in preparation of the assignment must be suitably referenced in the text.
9. Marks will be awarded only to the sections and subsections clearly indicated as per the problem statement/exercise/question

Preamble

The Computational Intelligence course aims to teach the concepts of computational intelligence, intelligent agents, and their applications. The principles of knowledge representation, search strategies, learning, reasoning, and planning are covered in detail. Application of principles of computational intelligence for machine learning, robotics and perception are discussed. Students are required to analyze a given scenario and apply the principles of computational intelligence to design & synthesize intelligent agents.

Multidimensional optimization is an important aspect of an engineer's life. The success of engineering and management processes depends on the extent of optimization achieved. There are analytical deterministic tools which can handle the problem of multidimensional optimization. These include integer programming, linear programming, dynamic programming and other methods. Unfortunately, these techniques are either difficult to apply or they may take considerable time to reach to an acceptable solution in some problems. These techniques suffer from the curse-of-dimensionality and application of these methods may require a transformation of the original model of the problem.

Alternatively, researchers have developed a wide range of bio-inspired, algorithms to tackle this problem from the domains of Computational Intelligence (CI). Some of these algorithms include Genetic Algorithm (GA), Particle Swarm Optimization algorithm (PSO), Ant Colony Optimization (ACO), Artificial Bee Colony (ABC) algorithm etc. These algorithms have gained popularity due to their resource-efficiency and their ability to get near-optimal solutions in acceptable time frames. Students are required to study and apply these bio-inspired metaheuristic algorithms to perform the optimization in the following use case. Perform the simulation using Python or MATLAB software.

Part A

(10 Marks)

Maximize the following objective function with the given constraints. Use Genetic Algorithm with a population of 30 chromosomes and 100 iterations.

$$\left\{ \begin{array}{l} \max \sqrt{x_1} + \sqrt{x_2} + \sqrt{x_3} \\ \text{subject to:} \\ x_1^2 + 2x_2^2 + 3x_3^2 \leq 1 \\ x_1, x_2, x_3 \geq 0. \end{array} \right.$$

Your report should include:

1. Steps in Genetic algorithm with respect to given problem
2. Software Simulation with sample input and output

Part B

(15 Marks)

An engineer wants to design a cylindrical can to hold 200 ml of a soft drink. Consider the radius r and height h as the optimization variables to determine the design resulting in the minimum surface area. Recommend the most suitable bio-inspired CI algorithm to address the challenge.

Your report should include:

1. Justification that the recommended algorithm is the best fit to the challenge.
2. Discuss the biological inspiration for the recommended algorithm.
3. Software Simulation with sample input and output
3. Conclusion