This project uses a Genetic Algorithm (GA) to solve the project scheduling problem with budget constraints and risk management factors. GA operates on a population of candidate solutions, called individuals, and iteratively refines them through a series of genetic operators, such as selection, crossover (recombination), and mutation. The goal is to find the optimal allocation of working hours for each team member to minimize the project duration while staying within the budget.

Here's a description of how the GA is applied to solve the problem:

1. Initialization: A population of random individuals is created. Each individual represents a possible allocation of working hours for the team members. The population size is determined by the population-size parameter.

2. Evaluation: Each individual in the population is evaluated using a fitness function. The fitness function calculates the project duration in days, considering the total working hours, the budget constraints, and the risk management factors (sick team members). Lower fitness values indicate better solutions.

3. Selection: The selection operator is applied to choose parents for crossover. In this case, a tournament selection method is used. A fixed number of individuals are randomly chosen from the population, and the one with the lowest fitness value is selected as a parent. This process is repeated until the desired number of parents is obtained.

4. Crossover: The crossover operator is applied to pairs of selected parents to create offspring. A single-point crossover is used, where a random crossover point is chosen, and the offspring are created by exchanging the working hours of the team members after the crossover point between the parents. The crossover is applied with a certain probability (crossover_prob).

5. Mutation: The mutation operator is applied to each offspring with a certain probability (1 / team_members). Mutation randomly changes the working hours of a team member to a new value between 0 and max_hours_per_day.

6. Replacement: The offspring replace the old population, and the evaluation step is repeated for the new population.

7. Termination: The GA continues iterating through steps 3 to 6 until a stopping criterion is met. In this case, the GA stops when the maximum number of generations (generations) is reached, or when the solution does not improve for a specified number of consecutive generations (max_generations_without_improvement).

After the GA terminates, the best individual with the lowest fitness value is considered the optimal solution, which represents the allocation of working hours for the team members that

minimizes the project duration while staying within the budget constraints and considering the risk management factors.