subjects are mandatory, if you write outside the designated area the answer will not be considered.

Which one of the following representations is NOT proper for the N-Queen problem? (50p)

a. Permutation of N size
b. Vectors of N integers
c. Vectors of N real numbers
(d) Binary

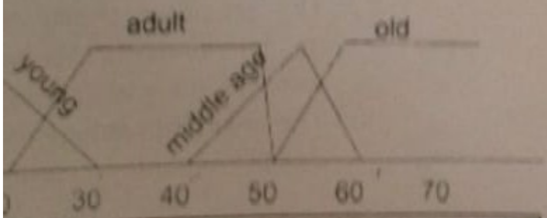
the answer (50p):

...e and track the search
...ce and also keep
...emory

What is the fitness function for the previous problem? (50p)

a. The number of queens placed on the same line
(b) The number of queens that attack each other
c. The number of queens placed on the same column
d. The difference in absolute value between the number of queens that attack each other on lines and the number of queens that attack each other on columns

Fuzzify the raw input data for a person of 25 years old. (250p)



4. Enumerate the elements that determine the probability for a new possible element to be added to the solution in an ant colony system. (150p)

optimal path in oriented graph, pheromone, paths, and colonies

5. On what is based the ant colony system? (50p)

(a) An evolutionary schema
b. The pheromone trace left by ants
c. Identical with PSO
d. Inertia and speed

6. What are the main specific features of a particle in PSO optimisation? (50p)

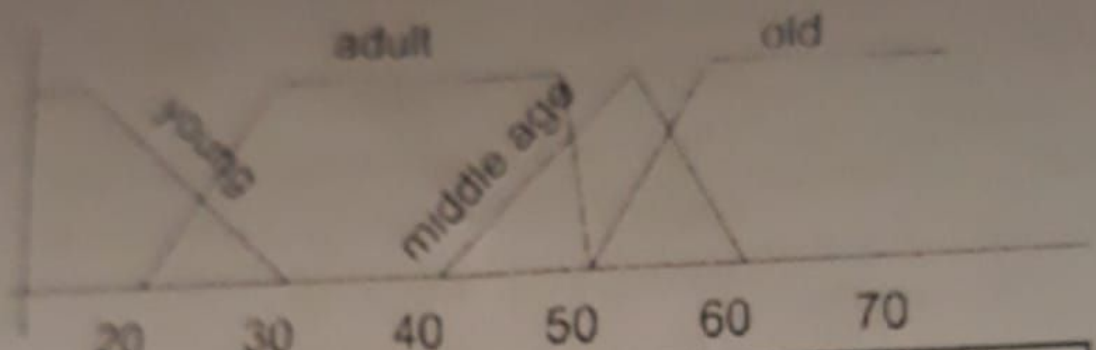
(a) Velocity and trace
b. Current position and velocity
c. Fitness function
d. There is no specific feature

7. What is a proper encoding for an individual in Genetic Programming? (50p)

a. depends on the problem
(b) a string of bits
c. a computer program that solve the given problem

All subjects are mandatory, if you write outside
be consider

1. Fuzzify the raw input data for a person of 45 years old. (250p)



2. Enumerate the element(s) that determine the probability for a new possible element to be added to the solution in an ant colony system. (150p)

3. What is a proper

d. a binary expression

8. Which one(s) of the following problems **can't** be solved by a perceptron? (50p)
   a. AND logic
   b. OR logic
   c. XOR
   d. any problem that implies a linear separation of a plane

9. How is propagated the error into an artificial neural network who uses as learning algorithm back-propagation? (50p)
   a. In both directions
   b. You don't compute the error for this algorithm
   c. In the same direction with the input signal
   d. It propagates backwards

10. Using an ANN we want to determine if a shape from a black and white image is a circle or not. The image has 10x10 pixels, and the ANN has the structure of 101:15:10:2 with a sigmoid activation function.

What is the problem's type? (50p)

for classification

11. How many weights will have the last neuron from the last layer (50p)?

sum of parent

12. On what will depend the adjusting value of the weights if we use a backpropagation algorithm to train the network? (50p)

frontier with weight values

13. Specify the correct statement(s) in a ruled based system in certain environments inference engine with Forward chaining (100p):
   a. Facts are represented in a working memory which is continually updated.
   b. The inference engine allows to draw new conclusions.
   c. The actions usually involve adding or deleting items from the working memory.
   d. The rules are of the form: left hand side (LHS) ==> right hand side (RHS).

14. Consider an evolutionary algorithm that is use to search the minimum of a real function that has a crossover operator

$$offspring = parent_1 + \alpha(paren_2 - parent_1)$$

with α in $[0,2]$.

Describe a possible pitfall if we use this crossover (50p):

15. For a Genetic Programing algorithm identify the correct statement(s) (100p):
   a. Very hard to implement.
   b. Convergence (complete, optimal) through global optima is slowly.
   c. The solution's quality depends on the precision of variables involved in the algorithm.
   d. The main advantage is that it doesn't depend on parameters.

as the chain rule is used in order to compute them

13. Specify the correct statement(s) in a ruled based system in certain environments inference engine with Forward chaining (100p):
    a. The inference engine allows to draw new conclusions.
    b. Facts are represented in a working memory which is continually updated.
    c. The actions usually involve adding or deleting items from the working memory.
    d. The rules are of the form: left hand side (LHS) ==> right hand side (RHS).

14. Consider an evolutionary algorithm that is use to search the minimum of a real function that has a crossover operator

$$offspring = parent_1 + \alpha * (parent_2 - parent_1)$$

with α in $[0, 2]$.

Describe a possible pitfall if we use this crossover (50p):

.....
.....
.....

15. For a Genetic Programming algorithm identify the correct statement(s) (100p):

(400p).

order crossover, partially mapped crossover, edge recombination, cycle, alternating edges, heuristic greedy or random or [illegible]
mutation by inversion, mutation by insertion, swap mutation

OX (order crossover) → copies a part of child chromosome from first parent and constructs remaining part following vertex ordering in second parent
PMX → similar to OX, the first parent's part between the two cut points is first copied to child
ERX → ignores arc directions & interprets chromosome as undirected cycle of edges
CX → tries to realize the idea that a vertex should be copied into child from one parent but its position should be inherited from other parent

17. For the following problem describe (NOT CODE) a solving method using evolutionar[y] computation (representation, operators, fitness, selection) (400p).

There is a set of cards printed with integer numbers. Select a subset in such a way tha[t] the sum of the numbers engraved on them should be M (or as closed of M as possible).

representation