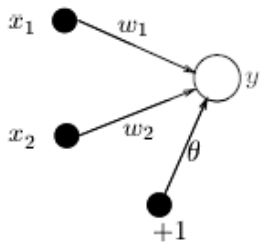
Universitas Sebelas Maret | **EL0703 Artificial Intelligence**
Electrical Engineering Department | **Midterm exam**
First Semester 2018/2019 | **Duration: 80 minutes (40m open book)**

Name :

ID :

Q1: What is the main difference between perceptron learning, delta rule and backpropagation? (5 points)

Q2: Suppose we have a simple ANN, which is initialized with the following weights and bias: w1=1.5, w2=2, θ=-2 and its has a threshold activation function.



$$y = \begin{cases} 1, & if\ (\sum_{i=1}^{2} wixi + \theta) > 0 \\ -1, & otherwise \end{cases}$$

Determine the **new weights and bias** using perceptron learning rule if we provide the ANN with a new training data: x=(0.4, 0.6) and target=+1. (15 points)

Q3: What is the meaning of fuzzification and defuzzificiation? Several methods for defuzzification are used in practice, list and describe them briefly! (10 points)

Q4: Using your own intuition, plot **fuzzy membership functions** for income/wealth of people (very poor, poor, average, rich, very rich). Use Sigmoid and Gaussian MFs. (10 points)

Q5: Describe briefly the **outline of basic genetic algorithm** (GA) method. Draw a flowchart or figure to make it clear. (10 points)

Q6: Given two types of books (X and Y), the price of type X books is Rp 30.000,- and the price of type Y books is Rp. 40.000,-. Supppose we want to use GA to find the maximum number of books of type X and the maximum number of books of type Y given a limited budget of Rp 1.000.000,-. Suggest a reasonable **fitness function** for this optimization problem. (10 points)

Q7: Design a fuzzy system for used car pricing (e.g. Toyota Avanza, Honda Brio, etc.). Also, assume that all cars are in good conditions (without any damage or malfunction). The inputs to the system are **driven distance** and **the age of the car** and the output is the **car price**. Select three suitable membership functions for each fuzzy variable. Use the following universe of discourses,

a. Driven distance (0 to 300,000 km)
b. Age (0 to 20 yrs.)
c. Price (0 to Rp. 300.000.000,-)

Determine the price of a five-year (5) old car with a driven distance of 125,000 km, according to your designed system and comment on the final price. (20 points)

Q8: (Homework) Make a midmap/block diagram/picture for all artificiall intelligence methods that we have studied (ANN, GA, and Fuzzy logic)! Make it detail as you can. (20 points)