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Soft Computing (CSP 3035) Lab Exam Quiz **AX Answer Key**

Q. 1 In an MP (McCulloch-Pitts) neuron with inputs[1][1] and weights [0.5, 0.3, 0.4] and threshold $\theta = 0.7$, what will be the output?

- ○ a) 0
- ● b) 1
- ○ c) 0.9
- ○ d) Cannot be determined

Q. 2 Which of the following statements about McCulloch-Pitts neurons is INCORRECT?

- ○ a) They can implement basic logical functions like AND, OR
- ○ b) They use binary inputs and outputs
- ● c) They can implement XOR function with a single neuron
- ○ d) They have a fixed threshold value

Q. 3 If a Hebbian learning rule states "neurons that fire together, wire together," which of these weight update equations correctly represents this principle?

- ○ a) $\Delta w_{ij} = \eta(t_i - y_j)x_j$
- ● b) $\Delta w_{ij} = \eta \times x_i \times y_j$
- ○ c) $\Delta w_{ij} = \eta \times x_i \times (t_i - y_i)$
- ○ d) $\Delta w_{ij} = \eta \times (t_i - y_i)^2 \times x_i$

Q. 4 A single-layer perceptron has inputs x = [2, -1, 3], weights w = [0.5, 0.6, -0.3], and bias 0.4. What is the net input before applying the activation function?

- ○ a) 0.5
- ○ b) 0.9
- ● c) -0.5
- ○ d) 1.2

Q. 5 Which of the following is TRUE about perceptron convergence?

- ○ a) A perceptron will converge for any classification problem
- ● b) A perceptron will converge only if the problem is linearly separable
- ○ c) A perceptron will converge faster with a higher learning rate regardless of the problem
- ○ d) A perceptron converges only if sigmoid activation is used

Q. 6 How is an Adaline (Adaptive Linear Neuron) different from a Perceptron?

- ● a) Adaline uses continuous activation function for learning but threshold function for final output
- ○ b) Adaline can solve non-linearly separable problems while Perceptron cannot
- ○ c) Adaline has multiple layers while Perceptron has only one
- ○ d) Adaline uses the Hebbian learning rule while Perceptron uses delta rule

Q. 7 In Madaline Rule I with OR logic at the output, if the target output is 1 but the actual output is -1, which Adaline units will have their weights updated?

- ○ a) All Adaline units in the network
- ○ b) Only the Adaline units with positive Zin values
- ● c) Only the Adaline units with negative Zin values
- ○ d) No Adaline units will have their weights updated

Q. 8 What is the derivative of the sigmoid activation function $f(x) = 1/(1 + e^{-x})$ used during backpropagation?

○ a) $f^{'}(x) = f(x)$
● b) $f^{'} = (x) = f(x) \times (1 - f(x))$
○ c) $f^{'}(x) = (1 - f(x))^2$
○ d) $f^{'}(x) = -f(x) \times log(f(x))$

Q. 9 In a fuzzy set, an $\alpha - cut$ is defined as?

○ a) The set of all elements whose membership value is exactly α
● b) The set of all elements whose membership value is greater than or equal to α
○ c) The set of all elements whose membership value is less than α
○ d) The set of all elements whose membership value is equal to 1

Q. 10 What is the membership value of an element that completely belongs to a fuzzy set?

○ a) 0
○ b) 0.5
● c) 1
○ d) Cannot be determined without additional information

Q. 11 Which component of a genetic algorithm evaluates the suitability of individuals in a population?

○ a) Encoding Mechanism
● b) Fitness Function
○ c) Crossover operator
○ d) Mutation operator

Q. 12 When using a Madaline with AND logic at the output layer, if target = 1, output = -1, and Zin values for the three Adaline units are [0.5, -0.2, -0.6], weights attached to which Zin values will be updated?

○ a) 0.5 only
● b. -0.2 and -0.6 only
○ c) 0.5, -0.2 and -0.6 (all of them)
○ d) None of them

Q. 13 Which genetic operator combines genetic material from two parents?

○ a) Mutation
● b) Crossover
○ c) Selection
○ d) Fitness evaluation

Q. 14 When using a Madaline with AND logic at the output layer, if target = -1, output = 1, and Zin values for the three Adaline units are [0.3, 0.8, -0.5], weights attached to which Zin values will be updated?

● a) 0.3 and 0.8 only
○ b) -0.5 only
○ c) 0.8 only
○ d) All of them

Q. 15 Which defuzzification method uses the point of maximum membership value?

○ a) Centroid
○ b) Bisector
● c) Mean of maxima
○ d) Weighted average