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

Q. 1 In perceptron weight update rule $\Delta w_i = \eta(t - o)x_i$, if target $t = 1$, output $o = 0$, learning rate $\eta = 0.1$, and input $x_i = 5$, what is Δw_i?

- ● a) 0.5
- ○ b) -0.5
- ○ c) 0.1
- ○ d) 5

Q. 2 In the MP model, what happens if an inhibitory input is active (i.e., set to 1)?

- ○ a) The neuron fires if excitatory sum exceeds threshold
- ○ b) The neuron fires regardless of inhibition
- ● c) The neuron will not fire, regardless of excitatory inputs
- ○ d) The neuron output is random

Q. 3 If the presynaptic neuron fires (input = 1) and the postsynaptic neuron does not (output = 0), what is the weight change according to Hebb's rule?

- ○ a) Positive
- ○ b) Negative
- ● c) Zero
- ○ d) Random

Q. 4 Consider a network using Hebbian learning with $\eta = 0.1$. If the presynaptic input is 0.7 and the postsynaptic output is 0.9, what is the weight change Δw?

- ● a) 0.07
- ○ b) 0.16
- ○ c) 0.63
- ○ d) 0.09

Q. 5 For a perceptron with $\eta = 0.2$, input $[3, -1]$, $target = 1$, and $output = 0$, the weight correction Δw is?

- ● a) [0.6, -0.2]
- ○ b) [0.2, -0.2]
- ○ c) [0.6, 0]
- ○ d) [0.3, -0.1]

Q. 6 In Adaline, weights are updated using which formula?

- ○ a) $\Delta w_i = \eta(t - o)x_i$
- ● b) $\Delta w_i = \eta(t - zin)x_i$
- ○ c) $\Delta w_i = \eta \times y_i \times y_j$
- ○ d) $\Delta w_i = \eta(t - o)o(1 - 0)x_i$

Q. 7 In Madaline Rule I with AND 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) Only the Adaline unit with Zin closest to zero

Q. 8 If a Madaline network with 3 Adaline units in the hidden layer produces Zin values of [0.7, -0.3, 0.5] and uses a threshold activation function, what will be the hidden layer outputs?

● a) [1, -1, 1]
○ b) [0.7, -0.3, 0.5]
○ c) [1][1]
○ d) [0.7, 0, 0.5]

Q. 9 In backpropagation, the weight update for the output layer is calculated as?

○ a) $\Delta w_{ik} = \eta \times \delta_k \times y_j$
○ b) $\Delta w_{jk} = \eta \times \delta_j \times x_k$
○ c) $\Delta w_{jk} = \eta \times \delta_k \times (1 - \delta_k) \times y_j$
● d) $\Delta w_{jk} = \eta \times (t_k - o_k) \times o_k \times (1 - o_k) \times y_j$

Q. 10 For a hidden layer neuron with $\delta = 0.05$, output $\delta_k = [0.1, -0.2]$, and weights $w = [0.4, -0.3]$, the error term δ_j is?

○ a) $0.05 \times (0.1 \times 0.4 + (-0.2) \times (-0.3))$
○ b) $(0.1 + (-0.2)) \times 0.05$
○ c) $0.05 \times (0.4 - 0.3)$
● d) $0.1 \times 0.4 + (-0.2) \times (-0.3)$

Q. 11 When using a Madaline with OR logic at the output layer, if target = -1, output = 1, and Z_{in} values for the three Adaline units are [0.7, -0.4, 0.2], weights attached to which Zin values will be updated?

○ a) 0.7 and 0.2 only.
○ b) -0.4 only
● c) 0.7 only
○ d) All of them

Q. 12 In a genetic algorithm with population size 100, if the selection uses roulette wheel method and the fitness values are all equal, what is the probability of any individual being selected?

● a) 1%
○ b) 5%
○ c) 10%
○ d) cannot be determined

Q. 13 How is the bias term incorporated into the perceptron's weight vector?

● a) Treated as a weight with input fixed to 1
○ b) Added after computing $w \cdot x$
○ c) Multiplied by a dummy feature
○ d) Multiplied by a dummy feature

Q. 14 Given $\mu A(x) = 0.4$, $\mu B(x) = 0.6$, what is $\mu A \cup B(x)$ using the algebraic sum operator?

○ a) 0.6
○ b) 1.0
● c) 0.76
○ d) 0.24

Q. 15 A fuzzy set over a, b, c has $\mu(a) = 0.4$, $\mu(b) = 1$, $\mu(c) = 0$. Which is true about its cardinality?

○ a) 1
● b) 1.4
○ c) 2
○ d) 0.4