

1. Determine true or false of the following statements

- (1) Intelligent behaviors include inference, learning, and creativity.
- (2) Aim of artificial neural network approaches is to combine best features of both conventional computer and brain machine.
- (3) An artificial neuron model is a linear device with sum, connection weights, and activation functions.
- (4) Conventional computer has adaptation by changing the connectivity, while artificial neural network is hard to be adaptive.
- (5) Artificial intelligence, artificial neural networks, evolutionary computing, fuzzy systems, and expert systems are mutually independent.
- (6) An artificial neural network may consist of biological neurons.

2. Let activation functions be

$$f(x) = \frac{1 - e^{-2\lambda x}}{1 + e^{-2\lambda x}}$$

Show its derivation is function of the function.

3. Consider the following energy function

$$E = \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n w_{ij} v_i v_j$$

where

$$w_{ij} = \frac{1}{1 + e^{-s_{ij}}}, \quad s_{ij} = v_i v_j, \quad v_i = x_i(t)$$

Finding dE / dt

4. Let $(1,1,0,0)$ be the output of the MCP neuron for each of the following lists of inputs.

1. $x_1 = 1, x_2 = 1$

2. $x_1 = 1, x_2 = 0$

3. $x_1 = 0, x_2 = 1$

4. $x_1 = 0, x_2 = 0$

in a case that an MCP neuron with $w_1 = 0.3, w_2 = 0.1$. Find $T = ?$