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. Consider the following energy function

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

where

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

Finding dE/dt

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

***1. x1*= 1, *x2*= 1**

***2. x1*= 1, *x2*= 0**

***3. x1*= 0, *x2*= 1**

4. *x1*= 0, *x2*= 0

in a case that an MCP neuron with *w1* = 0.7, *w2* = 0.3. Find *T* = ?

4. Using adaline learning algorithm to determine the weights and bias of the adaline network for solving the OR problem given below

x_1	x_2	t
-1	-1	-1
-1	1	1
1	-1	1
1	1	1

where the adaline network : $y = \text{sgn}(w_1 x_1 + w_2 x_2 + \theta)$

5. (i) Show that two class of patterns below are not linearly separable.

$$\text{class I}: \quad X_1 = \begin{bmatrix} -1 \\ -1 \\ 1 \\ 1 \end{bmatrix}, \; X_2 = \begin{bmatrix} 1 \\ 1 \\ -1 \\ -1 \end{bmatrix} \quad d_1 = 1$$

$$\text{class II}: \quad Y_1 = \begin{bmatrix} -1 \\ 1 \\ -1 \\ 1 \end{bmatrix}, \; Y_2 = \begin{bmatrix} 1 \\ -1 \\ 1 \\ -1 \end{bmatrix} \quad d_2 = -1$$

(ii) Designing a RBF neural network to separate them by using a Gaussian activation function.

6.Using the following two-layer network to solve XOR. Giving a MATLAB program of BP algorithm to learn weights and biases.

X_1	X_2	T
-1	-1	0
-1	1	1
1	-1	1
1	1	0

Initial values

- Let W_{11}=1, W_{21}= -1, W_{12}= -1, W_{22}=1, W_{13}=1, W_{23}=1, Θ_1=1, Θ_2=1, Θ_3=1, η =0.1