Artificial Neuron Practice Questions with Solutions

Question 1

Inputs: x1=1.0, x2=-1.5, x3=0.5

Weights: w1=0.4, w2=-0.6, w3=0.1

Bias: b=0.2

Tasks:

1. Compute the weighted sum (net input).

2. Apply sigmoid activation function to compute the output.

Solution:

Weighted sum (z) = (x1*w1) + (x2*w2) + (x3*w3) + b

Calculation: $(1.0 \times 0.4) + (-1.5 \times -0.6) + (0.5 \times 0.1) + 0.2 = 1.5500$

Sigmoid output = $1 / (1 + e^{(-1.5500)}) \approx 0.8249$

Question 2

Inputs: x1=-0.3, x2=0.8, x3=1.2

Weights: w1=0.5, w2=-0.2, w3=0.3

Bias: b=-0.1

Tasks:

1. Compute the weighted sum (net input).

2. Apply sigmoid activation function to compute the output.

Solution:

Weighted sum (z) = (x1*w1) + (x2*w2) + (x3*w3) + b

Calculation: (-0.3 × 0.5) + (0.8 × -0.2) + (1.2 × 0.3) + -0.1 = -0.0500

Sigmoid output = 1 / (1 + e^(--0.0500)) ≈ 0.4875

Question 3

Inputs: x1=0.7, x2=-1.0, x3=0.3

Weights: w1=-0.5, w2=0.9, w3=0.1

Bias: b=0.05

Tasks:

1. Compute the weighted sum (net input).

2. Apply sigmoid activation function to compute the output.

Solution:

Weighted sum (z) = (x1*w1) + (x2*w2) + (x3*w3) + b

Calculation: (0.7 × -0.5) + (-1.0 × 0.9) + (0.3 × 0.1) + 0.05 = -1.1700

Sigmoid output = 1 / (1 + e^(--1.1700)) ≈ 0.2369

Question 4

Inputs: x1=1.5, x2=-0.5, x3=1.0

Weights: w1=0.6, w2=-0.1, w3=0.4

Bias: b=0.0

Tasks:

1. Compute the weighted sum (net input).

2. Apply sigmoid activation function to compute the output.

Solution:

Weighted sum (z) = (x1*w1) + (x2*w2) + (x3*w3) + b

Calculation: (1.5 × 0.6) + (-0.5 × -0.1) + (1.0 × 0.4) + 0.0 = 1.3500

Sigmoid output = 1 / (1 + e^(-1.3500)) ≈ 0.7941

Question 5

Inputs: x1=-0.7, x2=0.3, x3=0.9

Weights: w1=0.2, w2=-0.5, w3=0.7

Bias: b=-0.2

Tasks:

1. Compute the weighted sum (net input).

2. Apply sigmoid activation function to compute the output.

Solution:

Weighted sum (z) = (x1*w1) + (x2*w2) + (x3*w3) + b

Calculation: (-0.7 × 0.2) + (0.3 × -0.5) + (0.9 × 0.7) + -0.2 = 0.1400

Sigmoid output = 1 / (1 + e^(-0.1400)) ≈ 0.5349