# Answer Sheet – Equation-Based AI Final Tasks

## Task 1 – Linear Function & Regression Error

a) Predicted outputs (yᵢ′):

Object 1: y′ = 2\*1 + 3\*2 + 4\*3 + 1 = 2 + 6 + 12 + 1 = 21

Object 2: y′ = 2\*2 + 3\*1 + 4\*0 + 1 = 4 + 3 + 0 + 1 = 8

Object 3: y′ = 2\*1 + 3\*0 + 4\*1 + 1 = 2 + 0 + 4 + 1 = 7

b) Error:

Error = (18 - 21)^2 + (7 - 8)^2 + (8 - 7)^2 = 9 + 1 + 1 = 11

## Task 2 – Distance Metrics

a) Manhattan distance: |1-2| + |3-1| + |5-4| = 1 + 2 + 1 = 4

b) Euclidean distance: √[(1-2)^2 + (3-1)^2 + (5-4)^2] = √(1 + 4 + 1) = √6 ≈ 2.45

c) Hamming distance: x2 ('Blue') ≠ y2 ('Green') → distance = 1 (only one feature differs)

## Task 3 – MLP: Output & Hidden Errors

a) error\_output = 0.6 \* (1 - 0.6) \* (1 - 0.6) = 0.6 \* 0.4 \* 0.4 = 0.096

b) error\_hidden = 0.7 \* (1 - 0.7) \* 0.096 \* 0.4 = 0.7 \* 0.3 \* 0.096 \* 0.4 ≈ 0.0081

## Task 4 – Weight Update

a) Output layer: w\_new = 0.3 + 0.1 \* 0.096 \* 1 = 0.3 + 0.0096 = 0.3096

b) Hidden layer: w\_new = 0.3 + 0.1 \* 0.0081 \* 1 = 0.3 + 0.00081 = 0.30081

## Task 5 – Centroid Calculation

Centroid = ( (2 + 4 + 6)/3 , (3 + 5 + 1)/3 ) = (12/3, 9/3) = (4, 3)

## Task 6 – Sigmoid Reference (Bonus)

From chart: sigmoid(2.0) ≈ 0.88; sigmoid(-1.0) ≈ 0.27