Question 1: -

Final Membership Matrix: -

[0.9004194369838193, 0.0995805630161806]

[0.9949420165869196, 0.00505783413080295]

[0.30157001346507506, 0.6984299865349249]

[0.7735414589686295, 0.22645854103137047]

[0.0681936999345313, 0.9318063000654687]

[0.07771788532174172, 0.9222821146782583]

Cluster Centres: -

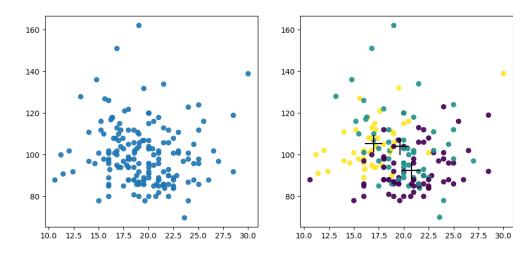C1 = [2.2059585287225554, 5.207418029497782]

C2 = [4.904744368409553, 7.892983727070714]

Question 2: -

Ground Truth Labels: -
[1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3]

1. Accuracy Achieved with truly random vectors = 40.13%
    Predicted Cluster Labels: -
    [1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 1, 1, 2, 2, 1, 1, 2, 1, 1, 1, 1, 1, 1, 2, 2, 1,
    1, 2, 2, 1, 1, 2, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 1, 1, 3, 2, 3, 2, 3, 3, 2, 3, 3, 2, 2, 2, 3, 3, 1, 2, 3,
    3, 3, 2, 3, 3, 2, 2, 3, 3, 3, 3, 3, 2, 2, 3, 3, 3, 3, 3, 2, 2, 3, 2, 3, 2, 3, 3, 3, 2, 3, 3, 3, 3, 2, 3, 3, 2, 3,
    3, 3, 3, 3, 3, 3, 2, 3, 3, 3, 3, 3, 3, 3, 3, 3, 2, 3, 3, 3, 2, 2, 2, 3, 3, 3, 2, 2, 3, 3, 2, 2, 3, 2, 2, 3, 3, 3,
    3, 2, 2, 2, 3, 2, 2, 2, 3, 2, 3, 2, 2, 3, 2, 2, 2, 2, 3, 3, 2, 2, 2, 2, 2, 3]

    Plots of Feature 4,5 with and without clustering: -

2. Accuracy Achieved with random values from multi-variate Gaussian distribution with zero-mean and unit variance = 40.13%

Predicted Cluster Labels: -

[2, 2, 2, 2, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1, 1, 1, 2, 2, 1, 1, 2, 2, 1, 2, 2, 2, 2, 2, 2, 2, 1, 1, 2, 2, 1, 1, 2, 2, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 1, 2, 2, 3, 1, 3, 1, 3, 3, 1, 3, 3, 1, 1, 1, 3, 3, 2, 1, 3, 3, 3, 1, 3, 3, 1, 1, 3, 3, 3, 3, 3, 1, 1, 3, 3, 3, 3, 3, 1, 1, 3, 1, 3, 1, 3, 3, 3, 1, 3, 3, 3, 3, 1, 3, 3, 1, 3, 3, 3, 3, 3, 3, 1, 3, 3, 3, 3, 3, 3, 3, 3, 3, 1, 3, 1, 3, 3, 1, 1, 1, 3, 3, 3, 3, 1, 3, 3, 1, 1, 3, 1, 1, 3, 3, 3, 3, 1, 1, 1, 3, 1, 1, 1, 3, 1, 3, 1, 1, 3, 1, 1, 1, 1, 3, 3, 1, 1, 1, 1, 1, 3] [Plotting features 4,5]