Cairo University
Faculty of Computers and Artificial Intelligence
Mid-Term Exam

Department: Information Technology	
Course Name: Pattern Recognition	**Date: April 2022**
Course Code: IT 352	**Duration: 1 hours**
Instructor(s): Dr. Mona Soliman	**Total Marks: 15 Marks**

Name :……..……SID:……

Question 1: (6 marks)

(a) State the main function of Principle Component Analysis (PCA) (1 mark)

(b) What are the steps involved in PCA Algorithm? (2 marks)

(c) Consider the two dimensional patterns (2, 1), (3, 5), (4, 3), (5, 6), (6, 7), (7, 8), Compute the Eigen values using PCA Algorithm. (3 marks)

Question 2: (4 marks) Consider the image given in (fig-1). **Construct** its normalized GLCM by assuming direction operator as next pixel on right side and calculate its homogeneity and uniformity to construct a test feature vector. Having two training samples with different classes, **Deduce** the class of the test feature vector.

Uniformity= $\sum_{i,j} C_{i,j}^2$, Homogeneity= $-\sum_{i,j} C_{i,j} log_2 C_{i,j}$

1	1	2	2
3	3	0	0
2	1	1	2
3	0	3	0

Figure-1

S No.	Uniformity	Homogeneity	Class
1	0.13	0.39	1
2	0.21	0.71	0

Question 3 (5 Marks)

(a) Write the formula of linear discriminate function based on minimum square error that can be used to classify between two classes . (1 mark)

(b) For the following samples (3 marks)

Class1: [1 1],[2 1] , [1 2], **Class2: [5 5],[6 5],[5 6]**

(i) Sketch the points of each class with different symbols

(ii) Draw the hyper plane line separating the two classes using linear discriminate function in part (a)

(iii) Draw a single perceptron model representing this classification problem

(c) To which class the point [3 3] belongs? (1 mark)