



Final Exam- First semester: First Trial 2023- 2024

Q1/ Explain each of the following statements briefly?

(15 Grades)

- 1) What are the parameters of Gaussian Distribution?
- 2) What is the roll of mean and standard deviation from the Gaussian Distribution?
- 3) How could you apply the Principle of Component Analysis in the **Quality Control**?
- 4) How do you use the Principle of Component Analysis to identify the **independent and dependent variables**?
- 5) What happen if **data is not normal** form the Principle of Component Analysis?

Q2/ Calculate the Eigen value and Eigen vector for each of the variance and covariance matrix as shown below

(15 Grades)

$$A = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix}$$

$$B = \begin{pmatrix} 13 & -4 & 2 \\ -4 & 11 & -2 \\ 2 & -2 & 8 \end{pmatrix}$$

Q3/ Suppose the random variables X1, X2, X3, and X4 have the Covariance matrix

(15 Grades)

$$A = \begin{pmatrix} 2 & -1 & 2 & -2 \\ -1 & 2 & 3 & -3 \\ 2 & 3 & 4 & -4 \\ -2 & -3 & -4 & 5 \end{pmatrix}$$

$$\lambda_1=0.506, \quad \lambda_2=1.57, \quad \lambda_3=2.95, \quad \lambda_4=11.12$$

$$e_1 = (0.112 \quad 0.121 \quad 0.977 \quad 1)$$

- 1- Calculate the proportion of total variance of the first and second Principle Component?
- 2- Calculate the correlation between component of **Y1 and variable X1,X2, X3?**

Q4/ from the data represents the degree of 5 students in three different subjects such as Mathematics, Statistics, and English find:

- 1- Standardized matrix?
- 2- Variance and Covariance matrix?

Student Name	Mathematics	Statistics	English
A	75	75	75
B	45	70	85
C	60	70	66
D	65	55	55
E	30	30	44

Good Luck