People's Democratic Republic of Algeria

Ministry of Higher Education and Scientific Research

University of Abbas Laghrour – Khenchela

Faculty of Economic Sciences, Commerce, and Management Sciences

Department of Management Sciences

Subject: Statistics03

Field/Specialization: commerce

Date: 14/01/2026

Time: 11:00 – 12:30

Third-Semester Examination in Statistics 03, Ordinary session

Academic Year 2025–2026

EX:01: (6.5 Points)

A bookstore receives customers according to a Poisson process at an average rate of **8 customers per hour**. Assume the number of customers arriving follows a Poisson distribution.

1. Compute the probability that **exactly 5 customers** arrive in the next hour.
2. What is the probability that **at most 3 customers** arrive in the next hour?
3. What is the probability that **no customers** arrive in the next **30 minutes**?
4. Find the **mean and variance** of the number of customers arriving in **90 minutes**.

Exo:02: (6.5 Points)

A manufacturing process for electronic components occasionally produces a defective item due to a rare but persistent flaw. From quality control history, about 8% of components produced are defective.
Let X **be the number of components tested until the first defective is found**, calculate the following

$$P(X = 3), \qquad P(X \geq 5), \qquad E(X), \qquad Var(X)$$

2- calculate $P(X \geq 8/X > 4)$ and explain how this illustrates the **memoryless property** of the geometric distribution.

Ex:03: (3 Points)
The lifetime X (in years) of a fuse in a backup power unit follows an exponential distribution with rate parameter $\lambda = 2$

1. What is the probability that the fuse lasts at least 1 year without failing?
2. What is the probability that the fuse fails within the first 0.5 years?
3. Find the median lifetime of the fuse

Exo: 04: (4 Points)

A random sample of size n=21 is drawn from a normal distribution with unknown mean u and unknown standard deviation s. Let $\bar{x}$ denote the sample mean and s the sample standard deviation. Consider the statistic

$$T = \frac{\bar{x} - u}{s/\sqrt{n}}$$

1. **Identify the sampling distribution** of T and its degrees of freedom
2. **Compute** $P(T > 2.845)$
3. **Determine** the symmetric interval $(-t^*, t^*)$such that $P(-t^* < T < t^*) = 0.99$
4. **Find the value** t such that $P(T < t) = 0.95$

Course Instructor:

1: Mouhcene Hamrit