Statistical tables and graphs are allowed

Answer all the following questions:

Question No. 1 [15 Marks]

I. The probability distribution of X, the number of defects in a metal sheet is given by:

X	0	1	2	3
P(x)	0.1	0.4	0.3	0.2

    a) Verify that X has a valid probability distribution   [1 Mark]
    b) Find $P(X \geq 2)$ [2 Marks]
    c) Find the mean and variance of X   [4 Marks]

II. Assume that the repair time in hours of a certain component in a machine has the following probability density function:

$$f(x) = \begin{cases} C(4x - 2x^2), & 0 < x < 2 \\ 0, & otherwise \end{cases}$$

    a) Find C such that f(x) is a valid probability density function   [2 Marks]
    b) Find $P(X > 1)$ [2 Marks]

III. It is given that $P(A) = 0.5$, and $P(B) = 0.3$. Find $P(A \text{ or } B)$ in the following cases:
    a) When A and B are mutually exclusive   [2 Marks]
    b) When A and B are independent   [2 Marks]

Question No. 2 [20 Marks]

I. Consider the grouped data given in the following Table:

Class limits	0-4	5-9	10-14	15-19	20-24
Frequency	6	11	6	4	3

    a) Find the mean, the mode, and the median.   [6 Marks]
    b) Find the coefficient of variation.   [4 Marks]
    c) Find coefficients of skewness α_1 and α_2.   [2 Marks]
    d) Given that the 4th moment about the mean $m_4 = 3324$, is this distribution normal, leptokurtic, or platykurtic? Why?   [2 Marks]

II. A factory has three assembly lines that produce memory chips. Line 1 produces 50% of the chips and has a defective rate of 4%; line 2 produces 30% of the chips and has a defective rate of 5%; line3 produces 20% of the chips and has a defective rate of 1%.

    a) If a chip is selected at random, find the probability that the chip is defective.   [3 Marks]
    b) If a chip is selected at random and it is found to be defective, what is the probability that it was assembled by line 2?   [3 Marks]

Question 3: (20 marks)

a- Suppose that a continuous production process is producing defectives at the rate of 10 percent. What is the probability that a random sample of 100 units contains:

1- At most 6 defectives?

2- At least 12 defectives?

3- Between 6 and 12 defectives?

(10 marks)

b- The life, in years, of a certain type of electrical switch has an exponential distribution with an average life $\beta = 2$. If 100 of these switches are installed in different systems, what is the probability that at most 30 fail during the first year? (10 marks)

Question 4: (15 Marks)

A manufacture of synthetic fiber advertised that his fiber has an average tensile strength of 30 pounds. A random sample of 100 fibers was tested for breaking strength. It showed an average of 28 pounds and a standard deviation of 12 pounds. Test the manufacture's claim using the 0.05 level of significance. Draw the OC curve for your test.

With our best wishes.

Dr. Mohamed Sharaf El-Din

Dr.Omaima Nada

	This exam measures the following ILOs						
Question Number	Q1 I(a) Q2	Q1-Ⅲ	Q3-b	Q2-Ⅱ	Q1Ⅰ-Ⅰ , Q3-a	Q2, Q4	
	a5-1	a6-1	a6-2	b11-1	b 14-1	C12-1	
Skills	Knowledge &Understanding Skills			Intellectual Skills		Professional Skills	