FACULTY OF ENGINEERING

Midterm Examination
2023-2024

K A UNIVERSITY

Department: Chemical Engineering
Stage/ Year: third Stage
Total Mark: 100

Course Title: Engineering Statistics
Course Code:
Time Allowed: 90 minutes
Attached Sheet:

Answer All Questions

1. Consider the data in the table below to answer the following questions (The table shows the amount of oil production in 40 days.) **(30 Marks)**

   a) Draw the box plot for the amount of oil production. b) Find an estimate for the median. c) Calculate the interquartile range.

Amount of oil produced (thousand barrels)	Number of days
31-35	9
36-40	6
- 41-45	15
46-50	3
51-55	1
56-60	2
61-65	2
66-70	1
71-75	1

2. The following frequency table shows the test score distribution for a random sample of 25 students in an introductory statistics class. **(30 Marks)**

300

Score	Relative Frequency
30-40	0.08
41-51	0.04
52-62	0.12
63-73	0.24
74-84	0.20
85-95	0.32

$1 - 0.08 - 0.04$

a. Find the missing relative frequency.

b. How many students in the sample had a score of at least 63?

c. If there are 800 students total in all of the introductory statistics classes, estimate how many students scored between 52 and 84 in the test.

d. Compute the Coefficient of Variation test scores for the sample.

$$CV = \frac{s}{\bar{x}}$$

*100

$25 \rightarrow 300$

7018

FACULTY OF ENGINEERING

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K **A**
UNIVERSITY

Course Title: Engineering Statistics
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3. Calculate Decile 4 and Percentile 75 for the company's salary listed below.   **(15 Marks)**

Salaries (per day in $)	Number of Employees
500-600	10
600-700	12
700-800	16
800-900	14
900-1000	8

4. The capital of a factory is $ 100,000. After one year, the factory capital is increased by <u>12</u> percent compared to the previous year, as well as in the third year, it increases by <u>9</u> percent compared to the second year, and in the fourth year, it increases by <u>16</u> percent compared to the third year. Calculate the growth rate in three years.   **(10 Marks)**
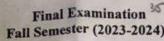
5. Consider the data below to answer the following questions (The data set is the number of minutes a sample of **10** people exercise each week).   **(15 Marks)**
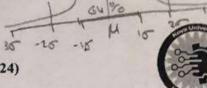
108, 139, 123, 132, 157, 124, 101, 135, 119, 127

Is the above data Symmetric?

KOYA UNIVERSITY

Faculty of Engineering
Department: Chemical Engineering
Stage: 3
Total Mark: 100

Course Title: Engineering Statistics
Course Code:KOU20454
Time Allowed: 120 minutes
Attached Sheet *Normal distribution table*

$m=$ $x=$

Answer All Questions
Note: be able to use normal distribution table (page 3)

1. A chemical engineer is examining the quality control of a chemical product. The concentration of a particular substance in this product is normally distributed with a mean (μ)of 50 milligrams per liter and a standard deviation (σ)of 5 milligrams per liter.   (25 Marks)

   0.6826

   a) What is the probability that a randomly selected sample has a concentration between 45 milligrams per liter and 55 milligrams per liter?

   0.6928

   b) What is the probability that a randomly selected sample has a concentration greater than 60 milligrams per liter?

   c) What concentration corresponds to the 95th percentile of this distribution?

2. A researcher is investigating the effect of temperature (in degrees Celsius) on the reaction rate (in moles per hour) in a chemical reaction. The data collected from 6 experiments is as follows:

   (25 Marks)

Sample	Temperature (°C)	Reaction Rate (moles /hour)
1	150	3.2
2	160	3.5
3	155	3.3
4	165	3.7
5	170	3.9
6	175	4.2

$x=\mu n$

$y=4.5x$

a) Using the above data, find the linear regression equation that relates the reaction rate to the temperature.

$-9.07+wu4x$

b) Using the calculated regression equation, predict the reaction rate for a temperature of 185 degrees Celsius.

c) What does the coefficient (b) in the regression equation represent? Does the result indicate that an increase in temperature significantly increases the reaction rate?

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KOYA UNIVERSITY

Faculty of Engineering
Department: DCHE
Stage: 3rd
Total Mark: 100

Midterm Examination
Spring Semester (2023-2024)

Course Title: ENGINEERING ECONOMICS
Course Code: KOU20455
Time Allowed: 90 minutes
Attached Sheet: NA

Dear Students: Please answer all questions.

1. Define the following:

a. Engineering Economics. b. Feasibility Study. c. Surplus. d. Demand.

(20 marks/5 marks)

2. List and describe the items of Production Cost that are required to be estimated to find out the project production cost?

(30 Marks)

3. Consider that you decided to establish a Recycling of Aluminum Soft Drink Cans project. However, you firstly needs to achieve a feasibility study for the project (Estimation of Capital Cost items). So write a complete feasibility study for the project. Given that: Production Capacity 20 tons/day, Daily working hours 10 hours/day, Number of operating days per year 300 days / year, The currency is US $ Consider each US $= 1500 ID, this factory consists of different departments as follow (Washing and preparation of cans pieces by sorting according to its color and size, Extrusion and granulation, Packaging, Maintenance workshops, Management), Land needed 1000 m^2 in industrial area (Assume its cost 10 TUS$), Total Equipment Cost= 22 TUS$, Assume the Site preparation cost 1 TUS$.

Hint: the factory need four halls as following: Equipment hall (200 m^2), Products storage hall (50 m^2), Services and Maintenance halls (100 m^2), Management hall (50 m^2).

All mentioned halls made of sandwich panel with concrete base and supplied by ventilation system. Its' local cost about 0.5 MID (Million Iraqi Dinars) for each 1 m^2.

Hint: The remaining area is 600 m^2 for n raw material washing and daily storage, roads and its guide, park and garden. It assumption cost is about 10 MID = 7 TUS$.

Hint: assume the Services Management Cost and Installation and Documents costs 12 TUS$ and 7 TUS$ respectively.

(50 Marks)

Best Wishes...
Examiner's Name: Mr. Ribwar K. Abdulrahman

KOYA
UNIVERSITY
Faculty of Engineering
Department: Chemical Engineering
Stage: 3
Total Mark: 100

Course Title: Engineering Statistics
Course Code:KOU20454
Time Allowed: 120 minutes
Attached Sheet *Normal distribution table*

3. For the following distributed data, calculate the quartiles (Q1, and Q3), and percentiles (specifically P20 and P30). **(25 Marks)**

$Q_1 = 18.5$ Q_{30}

Class	4.5-12.5	12.5-20.5	20.5-28.5	28.5-36.5	36.5-44.5	44.5-52.5	52.5-60.5	60.5-68.5
f	4	24	21	18	5	3	5	8

$Q3 = 36.075$ $P20 = 12$

4. A scientist is investigating the relationship between two different parameters in a chemical reactor: temperature (in degrees Celsius) and pressure (in bar). The data collected from 5 measurements is as follows: **(25 Marks)**

Sample	Temperature (°C)	Pressure (bar)
1	150	5.0
2	160	5.3
3	155	5.1
4	165	5.4
5	170	5.6

a) Using the above data, calculate the covariance between temperature and pressure.

b) Calculate the correlation coefficient between temperature and pressure and interpret the result. Is there a strong correlation between temperature and pressure?

c) Do your calculations lead to the conclusion that an increase in temperature results in an increase in pressure in the reactor?

$C = 0.9859$

covariance $= 10.86$

$S_x = 8.0043$

$S_y = 9.38$