SET A

AHMEDABAD UNIVERSITY
School of Engineering and Applied Science
2025-2026 Winter

ENR211 Statistics for Engineers
Final Examination
Monday 23 February 2026, 11:00 – 1:00

Name:	Roll no.	A U 2								Marks

Write your answers on this sheet and on the answer book. Attach this sheet to the answer book and then submit it. Answer all questions. Access to net is not allowed.

Q1	Q2	Q3	Q4	Q5	Q6	**	TOTAL

Instructions:

- Answer all questions.
- Show all necessary steps.
- Use of non-programmable calculator is permitted.
- Assume suitable data if required and state clearly.

Useful formulae

1. Covariance:

$$\mathrm{cov(X,Y)} = \frac{1}{\mathrm{N}}\sum_{\mathrm{i=1}}^{\mathrm{N}} \mathrm{x_i y_i} - \bar{\mathrm{X}}\bar{\mathrm{Y}} \tag{1}$$

2. Pearson's Correlation Coefficient:

$$r = \frac{\mathrm{cov}(X,Y)}{\sigma_X \sigma_Y} \tag{2}$$

3. Slope of the Regression Line of Y on X:

$$\mathrm{slope} = \mathrm{r}\cdot\frac{\sigma_\mathrm{Y}}{\sigma_\mathrm{X}} = \frac{\mathrm{cov(X,Y)}}{\sigma_\mathrm{X}} = \frac{\frac{1}{\mathrm{N}}\sum_{\mathrm{i=1}}^{\mathrm{N}} \mathrm{x_i y_i} - \bar{\mathrm{X}}\bar{\mathrm{Y}}}{\frac{1}{\mathrm{N}}\sum_{\mathrm{i=1}}^{\mathrm{N}} \mathrm{x_i^2} - \bar{\mathrm{X}}^2} \tag{3}$$

Space for scratch work

1. (*5 points*) **Fill in the Blanks**

i. The measure of dispersion given by maximum minus minimum is called _____.

ii. The square of standard deviation is called _____.

iii. A part of the population selected for study is called a _____.

iv. The theorem stating that sample means approach normality is the _____ theorem.

v. The correlation coefficient lies between _____ and _____.

2. (*7 points*)
The following data gives the heights (in cm) of 11 students:

150, 162, 158, 155, 170, 165, 160, 152, 168, 159, 163,

i. Plot the data using a histogram

ii. Find the mean and median.

iii. Find the range and standard deviation.

3. (*7 points*)
The following frequency distribution shows marks obtained in a test:

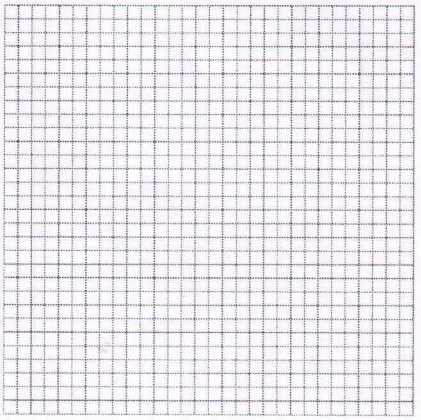
Marks	Frequency
0–10	5
10–20	9
20–30	14
30–40	17
40–50	15

i. Construct the cumulative frequency table.

ii. Draw the ogive curve.

iii. Estimate the median.

iv. Find the relative frequencies.



4. (*7 points*) **Hypothesis Testing**

A manufacturer claims that the mean lifetime of a battery is 600 hours. A random sample of 25 batteries has a mean lifetime of 580 hours and standard deviation 40 hours.

i. State the null and alternative hypotheses.

ii. Perform a suitable test at 5% significance level.

iii. State clearly your conclusion.

iv. Justify the choice of test.

5. (*7 points*) **Correlation and Regression**

The following data relates study hours (X) and exam scores (Y):

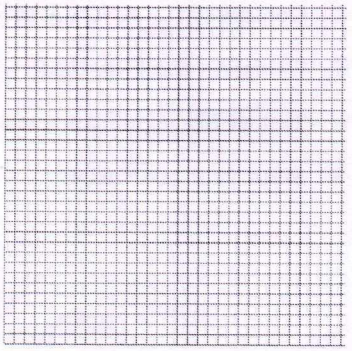
X	2	4	6	8	10	12
Y	35	45	55	65	70	80

i. Find the correlation coefficient.

ii. Comment on the nature of correlation.

iii. Find the regression equation of Y on X.

iv. Estimate Y when $X = 7$.



6. (*7 points*) **One-Way ANOVA**

A study was conducted to compare the tensile strength (in MPa) of materials produced by four different machines. The results are given below:

Sample	Machine A	Machine B	Machine C	Machine D
1	42	45	40	48
2	44	47	42	50
3	41	46	41	49
4	43	48	43	51
5	45	49	44	52

i. State the hypotheses for one-way ANOVA.

ii. Construct the ANOVA table.

iii. Calculate the F-statistic.

iv. Test at 5% significance level.

v. State your conclusion.

SET B

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Q1	Q2	Q3	Q4	Q5	Q6	**	TOTAL

Instructions:

- Answer all questions.
- Show all necessary steps.
- Use of non-programmable calculator is permitted.
- Assume suitable data if required and state clearly.

Useful formulae

1. Covariance:

$$\mathrm{cov(X,Y)} = \frac{1}{\mathrm{N}}\sum_{\mathrm{i=1}}^{\mathrm{N}} \mathrm{x_i y_i} - \bar{\mathrm{X}}\bar{\mathrm{Y}} \tag{1}$$

2. Pearson's Correlation Coefficient:

$$r = \frac{\mathrm{cov}(X,Y)}{\sigma_X \sigma_Y} \tag{2}$$

3. Slope of the Regression Line of Y on X:

$$\mathrm{slope} = \mathrm{r}\cdot\frac{\sigma_\mathrm{Y}}{\sigma_\mathrm{X}} = \frac{\mathrm{cov(X,Y)}}{\sigma_\mathrm{X}} = \frac{\frac{1}{\mathrm{N}}\sum_{\mathrm{i=1}}^{\mathrm{N}} \mathrm{x_i y_i} - \bar{\mathrm{X}}\bar{\mathrm{Y}}}{\frac{1}{\mathrm{N}}\sum_{\mathrm{i=1}}^{\mathrm{N}} \mathrm{x_i^2} - \bar{\mathrm{X}}^2} \tag{3}$$

Space for scratch work

1. (*5 points*)

i. The square root of variance is called _____.

ii. The most frequent observation is called _____.

iii. When variance is unknown and sample is small, we use the _____ test.

iv. The difference between max and min is called _____.

v. A sample is a _____.

2. (*7 points*) The following are the weights (in kg) of 12 packages:

48, 52, 50, 55, 47, 53, 51, 49, 54, 56, 46, 50

i. Plot the data using a histogram

ii. Find the mean and median.

iii. Find the range and standard deviation.

3. (*7 points*)

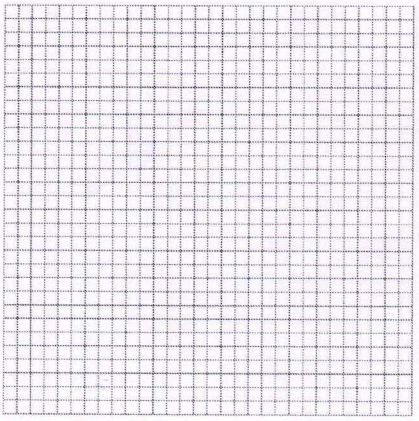
Marks	Frequency
0–10	6
10–20	10
20–30	12
30–40	18
40–50	14

i. Construct cumulative frequency table.

ii. Draw ogive.

iii. Find median.

iv. Find relative frequencies.



4. (*7 points*) A company claims that average daily production is 250 units. A random sample of 16 days gives mean 235 and standard deviation 30.

i. State hypotheses.

ii. Perform test at 5% level.

iii. Give conclusion.

iv. Justify test.

5. (*7 points*)

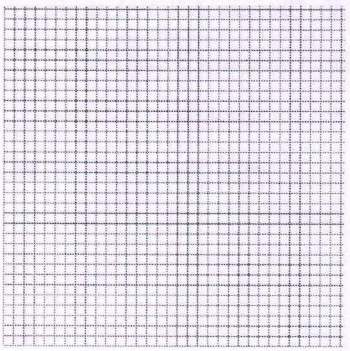
X	3	5	7	9	11	13
Y	40	50	58	68	75	85

i. Find correlation coefficient.

ii. Comment on relation.

iii. Find and plot regression line of Y on X.

iv. Predict Y for $X = 8$.



6. (*7 points*) Strength values (MPa) from four plants:

Sample	Plant A	Plant B	Plant C	Plant D
1	38	42	40	45
2	40	44	41	47
3	39	43	42	46
4	41	45	43	48
5	42	46	44	49

i. State the hypotheses.

ii. Prepare ANOVA table.

iii. Compute F-statistic.

iv. Test at 5%.

v. What is the correct decision?