JORDAN UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
ENGINEERING MEASUREMENTS (0944423)
Quiz-1, Section -1, Second SEMESTER 2007-2008
Dr. Jehad A. A. Yamin **Date:** 11th March, 2008
Time: 20 minutes. Form (A)

In a test, temperature is measured several times with variations in apparatus and procedures. After applying the known corrections, the results are:

Temperature °C	100	101	102	103	104
Frequency of occurrence	5	10	20	11	4

1) **What type of test is this?**
2) **What type of errors are present in the data?**
3) **Calculate**: (a) arithmetic mean, (b) mean deviation, (c) Deviation from the mean, (d) standard deviation, (e) the probable error of one reading, (f) the standard deviation of the mean, (g) the standard deviation of the standard deviation and the (h) Variance, (i) precision Index, (j) based on Chauvenet's theory, which data is to be rejected (Show one cycle only).

(20 Points)

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Number of Readings	Ratio of maximum acceptable deviation to standard deviation
10	1.96
15	2.13
25	2.33
50	2.57
100	2.81
300	3.14

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Time: 20 minutes. Form (B)

In a test, pressure is measured several times with variations in apparatus and procedures. After applying the known corrections, the results are:

Temperature °C	10	11	12	13	14
Frequency of occurrence	6	12	19	13	5

4) **What type of test is this?**
5) **What type of errors are present in the data?**
6) **Calculate**: (a) arithmetic mean, (b) mean deviation, (c) Deviation from the mean, (d) standard deviation, (e) the probable error of one reading, (f) the standard deviation of the mean, (g) the standard deviation of the standard deviation and the (h) Variance, (i) precision Index, (j) based on Chauvenet's theory, which data is to be rejected (Show one cycle only).

(20 Points)

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Number of Readings	Ratio of maximum acceptable deviation to standard deviation
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A liquid flows through a circular pipe having diameter of 10cm with velocity 1 m/s. If the limiting errors in velocity is ±3% and that for the pipe diameter was ±1%. Keeping in mind that the volume flow rate is found from the following equation:

$$\dot{Q} = A_P * u \qquad (m^3/s)$$

1) Calculate the volume flow rate inside the pipe.

2) Calculate the limiting error in the flow rate.

3) Calculate the relative limiting error in the flow rate.

4) If the uncertainty in pipe diameter was ±1% and that for velocity ±3%.. What will be the uncertainty in the flow rate?

5) What will be the relative uncertainty in the flow rate (%)?

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Time: 20 minutes. Form (D)

The stress in the mild steel flat circular plate is given by the following equation

$$s = \frac{3\,D^2\,P}{16\,t^2} \quad (N/m^2)$$

The plate has diameter (D) of 15mm, thickness (t) of 0.2mm and the pressure (P) applied was $300x10^3$ $N/m^{2.}$ If the limiting errors in pressure is ±1% and that for thickness was ±3%.

1) Calculate the value of stress on the plate.

2) Calculate the limiting error of the stress.

3) Calculate the relative limiting error of the stress.

4) If the uncertainty in pressure was ±1% and that for thickness was ±3%.? What will be the uncertainty in stress?

5) What will be the relative uncertainty in the stress (%)?