Submission Form

Fill up the following slots with appropriate content. You must submit the content of this document from this page only.

1. Your Name: Mohammad Shafkat Hasan
2. Your ID: 19101077
3. Your Section: 04
4. Experiment No: 3
5. Experiment Title: **To verify the value of vacuum permittivity by a parallel plate capacitor.**
6. **You must write your ID in each of the graphs you insert here.**

7. Data Table 1:

$$\boldsymbol{A} = 140\, \boldsymbol{mm^2}$$

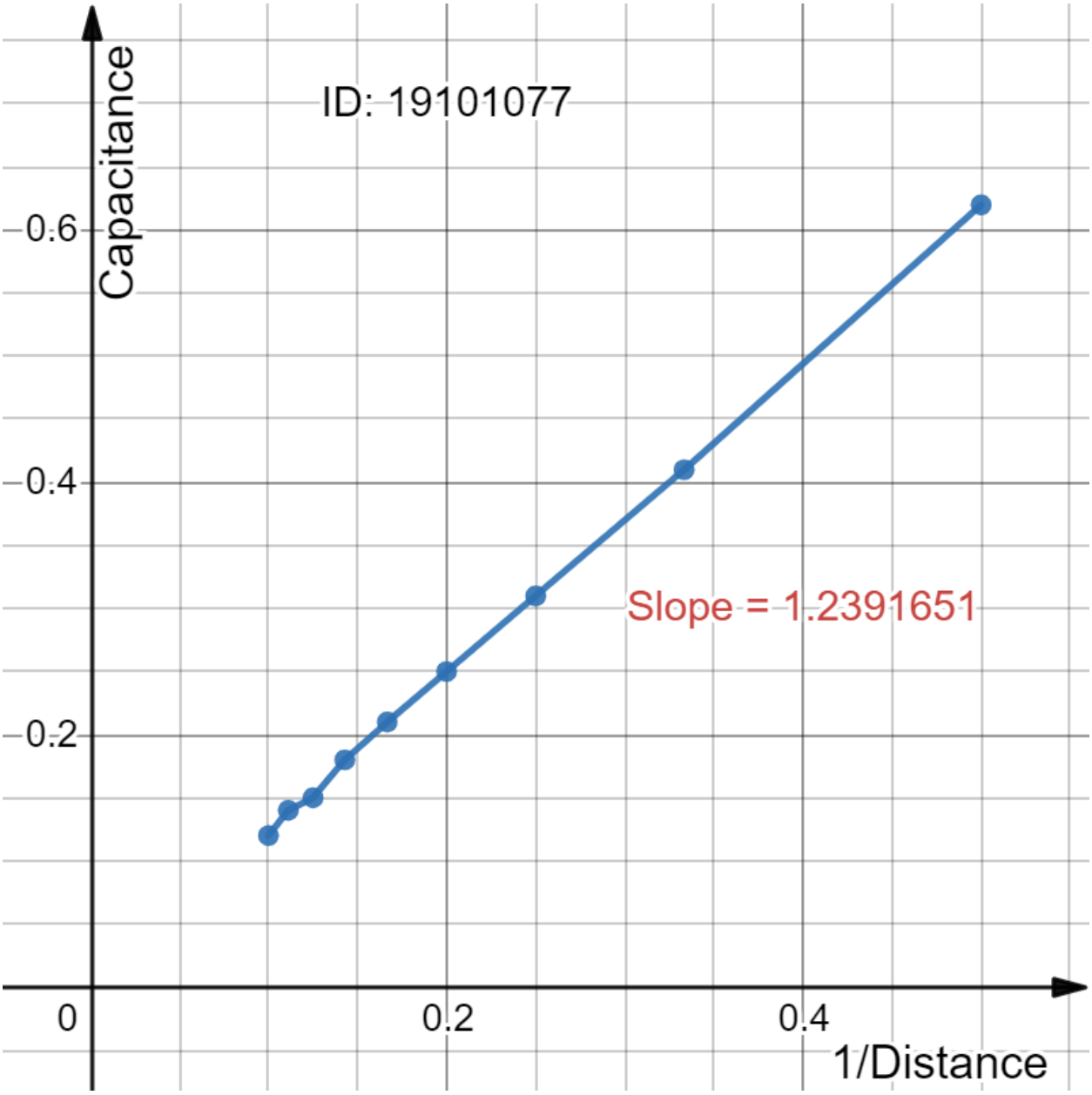
Sl:	**Separation between plates, d (mm)**	**Capacitance, C (pF)**
1.	2	0.62
2.	3	0.41
3.	4	0.31
4	5	0.25
5	6	0.21
6.	7	0.18
7.	8	0.15
8.	9	0.14
9.	10	0.12

8. Data Table 2:

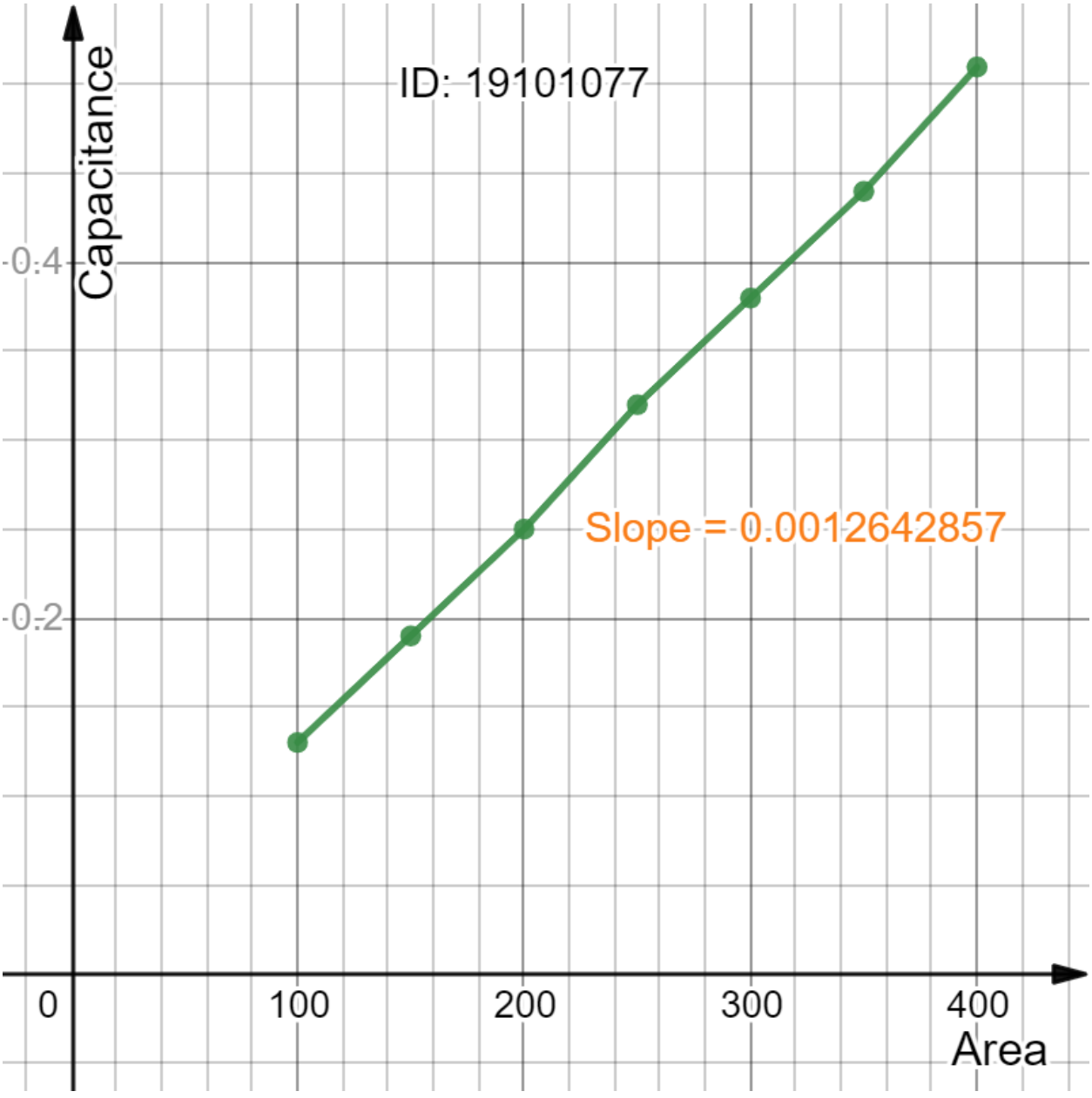
$$d = 7\ mm$$

Sl:	***Area, A*** ***(mm^2)***	**Capacitance, C** **(pF)**
1.	100	0.13
2.	150	0.19
3.	200	0.25
4	250	0.32
5	300	0.38
6.	350	0.44
7.	400	0.51

9. Draw C vs 1/d graph for Data Table 1 and, that is, you plot 1/d along the x-axis and C along the y-axis. You will get a straight line. Find the slope of the line.
Insert graph-1 (for A) as image here:



10. Draw C vs A graph for Data Table 2 and, that is you plot A along the x-axis and C along the y-axis. You will get a straight line. Find the slope of the line. Insert **graph-2** (for d) as image here:



[Use the formula for capacitance of a parallel plate capacitor to compute vacuum permittivity from slope.]

11. For Data Table 1,

Slope = 1.23917 $\frac{pF}{mm^{-1}}$

Calculated value of vacuum permittivity, = $(\frac{Slope}{Area} \times 10^{-9})$

= $8.851214286 \times 10^{-12}\ C^2N^{-1}m^{-2}$

12. For Data Table 2,

Slope = 0.00126429 $\frac{pF}{mm^2}$

Calculated value of vacuum permittivity, = $(Slope \times Distance \times 10^{-9})$

= $8.85003 \times 10^{-12}C^2N^{-1}m^{-2}$

13. From the calculated value of vacuum permittivity from 11 & 12, we calculate the mean.

Mean vacuum permittivity = $8.850622143 \times 10^{-12}C^2N^{-1}m^{-2}$.

Comparing the calculated mean vacuum permittivity with the with the standard value of vacuum permittivity ($\varepsilon_0 = 8.854 \times 10^{-12}C^2N^{-1}m^{-2}$), we calculate the percentage of error.

Percentage of error = [| Calculated mean vacuum permittivity - Standard vacuum permittivity| /Standard vacuum permittivity] * 100

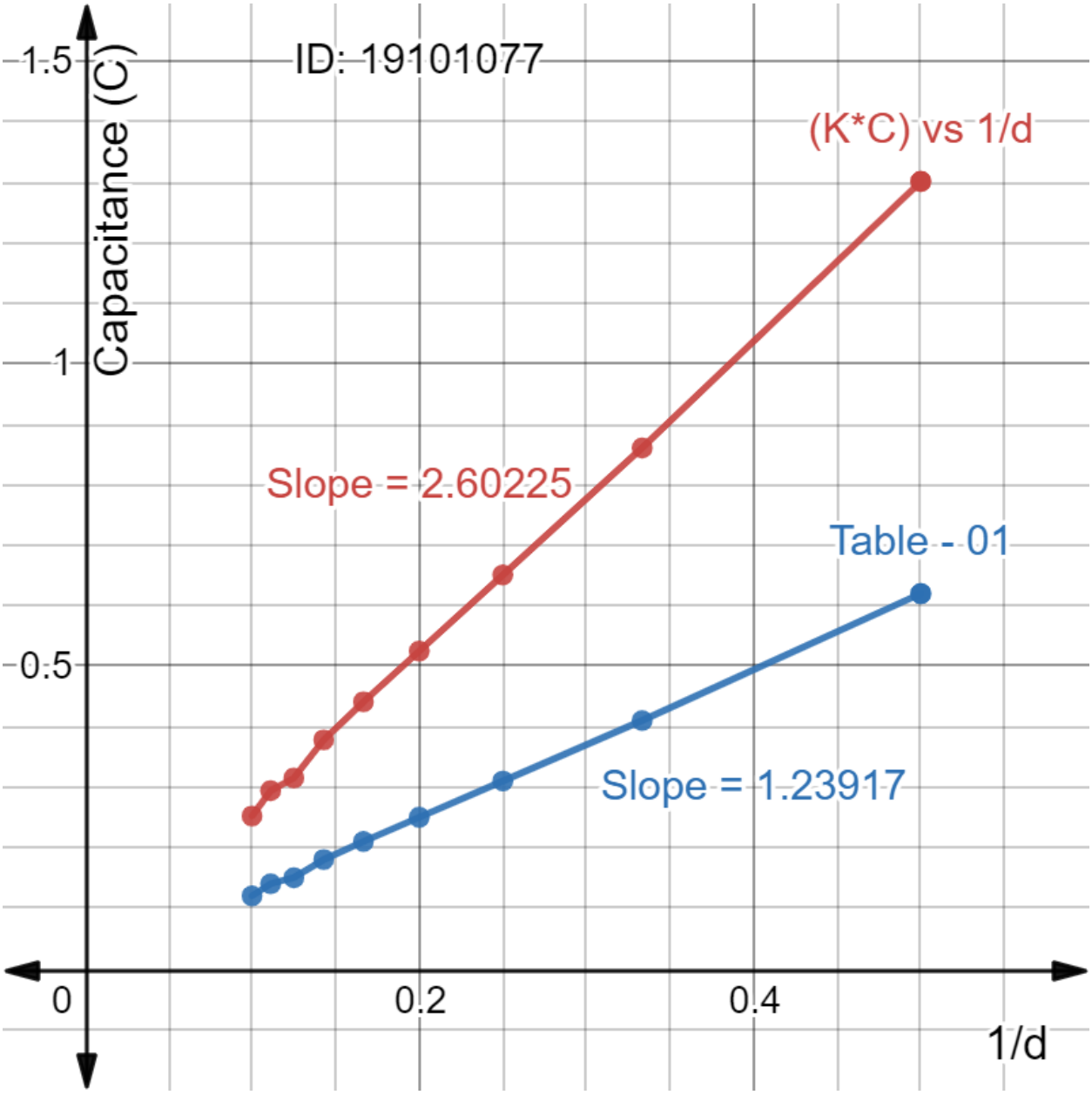
= 0.0382 %

You are ***strongly*** encouraged to use your **own words** to describe your thoughts for the following part. **However, any kind of plagiarism (such as copying and pasting from other students' lab-reports) will not be tolerated and will be subject to disciplinary action according to BracU policy.**

Please briefly answer the following question(s):

13. If we place a dielectric material of dielectric constant, κ>1 in place of air in between the plates of a parallel plate capacitor then what should be the change in graph-1 (C vs 1/d graph for Data Table 1)? Explain.
hint: You may sketch a diagram in your answer to help you compare both the cases.

Ans:



If we place a dielectric material like Teflon (κ=2.1) which dielectric constant, κ>1 in place of air with κ = 1, the values of capacitance increase. For each value of '1/d' value of C increase by C = κ * C. If we use Teflon which value of κ=2.1, the value of C will be C = 2.1 * C. After placing new C in graph the of new graph become 2.60225 where Table-01 slope is 1.23917.