Ahmedabad University

Sensors, Instrumentation, and Experimentation

Assignment - 1

Section - 1

Submitted to faculty: Prof. Ashok Ranade

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Student Details

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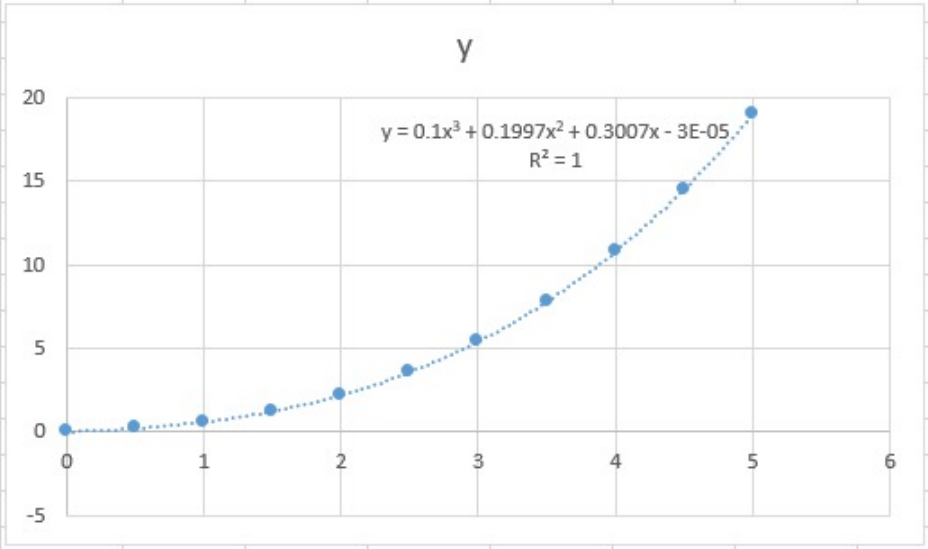
2021-2022 (Monsoon Semester)

Q1 (A)

	x	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5		
	y	0	0.213	0.6	1.238	2.2	3.563	5.4	7.788	10.8	14.51	19		



a0	-0.00003
a1	0.3007
a2	0.1997
a3	0.1

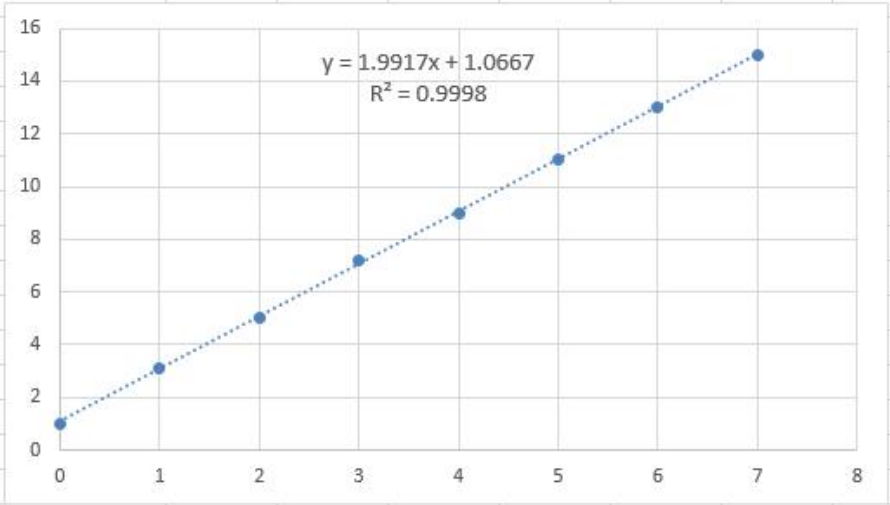
Equation	y = 0.1x³ + 0.1997x² + 0.3007x - 3E-05
	R² = 1

Q1 (B)		0	0.213	0.6	1.238	2.2	3.563	5.4	7.788	10.8	14.51	19	
	y calculated	-0.00003	0.21275	0.60037	1.23785	2.20017	3.56235	5.39937	7.78625	10.798	14.5095	18.99597	
	(ycalculated - y)^2	9E-10	6.25E-08	1.37E-07	2.25E-08	2.89E-08	4.23E-07	3.97E-07	3.06E-06	4E-06	2.5E-07	1.62E-05	
												MSE	0.0000022385909

1C

x	0	1	2	3	4	5	6	7
y	1	3.1	5	7.2	9	11	13	15
x-x mean	-3.5	-2.5	-1.5	-0.5	0.5	1.5	2.5	3.5
y-y mean	-7.0375	-4.9375	-3.0375	-0.8375	0.9625	2.9625	4.9625	6.9625
(x-xmean)(y-ymean)	24.63125	12.34375	4.55625	0.41875	0.48125	4.44375	12.40625	24.36875
(x-xmean)(x-xmean)	12.25	6.25	2.25	0.25	0.25	2.25	6.25	12.25

X Mean	3.5
Y Mean	8.0375
SumNum	83.65
SumDen	42



m	1.991667
c	1.066667

Equation **y=1.991667x+1.066667**

(Least Square Method)

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Q2

Temp	y (mV)
-70	100
380	4800

$y = mx + c$

$m = \frac{4800 - 100}{380 - (-70)} = \frac{4700}{450}$

$y = \frac{4700}{450} x + c$

$100 = \frac{4700}{450}(-70) + c$

$100 = -\frac{6580}{9} + c$

$c = \frac{6580 + 900}{9} = \frac{7480}{9}$

$\therefore \quad y = \frac{94}{9} x + \frac{7480}{9}$ ——— (1)

Max input = 3.3 V (3.3 = 4800/dividing factor)

$\therefore \quad y_1 = \frac{y \times 3.3}{4800}$

$y_1 = \frac{94 \times 1.1}{9 \times 1600} x + \frac{7480 \times 1.1}{9 \times 1600}$

$y_1 = \frac{517}{72000} x + \frac{2057}{3600}$ ——— (2)

ADC → 10 bit → 0 to 1023

1023 → 3.3 V at y_1

$y_2 = \frac{1023}{3.3} y_1 \quad ; \quad y_1 = \frac{3.3}{1023} y_2$

$$\frac{3.3}{1023} y_2 = \frac{517x}{72000} + \frac{2057}{3600}$$

$$\frac{y_2}{310} = \frac{517x}{72000} + \frac{2057}{3600}$$

$$x = \left(\frac{y_2}{310} - \frac{2057}{3600}\right) \frac{72000}{517}$$

$$x = \frac{(360y_2 - 63767)\,7200}{11160 \times 517}$$

$$\boxed{x = \frac{7200y_2 - 1275340}{16027}}$$

or $$\boxed{x = 0.44924\,y_2 - 79.57446}$$