INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad – 500 043

LABORATORY WORK SHEET

Date: 17/06/2022

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Exp No: 03 Experiment Name: STEWART AND GEE'S EXPERIMENT

DAY TO DAY EVALUATION:

	Preparation	Algorithm / Performance in the Lab	Source Code / Calculations and Graphs	Program Execution / Results and Error Analysis	Viva	Total
Max. Marks	4	4	4	4	4	20
Obtained	4	4	4	4	4	20

Signature of Lab I/C

START WRITING FROM HERE:

AIM: To determine the field of induction at several points along the axis of a circular coil carrying current using Stewart and Gee's experiment.

APPARATUS:
1) Stewart and Gee's galvanometer
2) Battery eliminator
3) Ammeter
4) Commutator
5) Rheostat
6) Plug keys
7) Connecting wires

FORMULA: $B = \frac{\mu_0 n i a^2}{2(x^2+a^2)^{3/2}}$ $B = B_e \tan\theta$

$\mu_0 = 4\pi \times 10^{-7}$ H/m
n = no of turns in coil
i = current through coil(cm)
a = radius of the coil
x = distance from centre of coil to centre of magnet (cm)

DIAGRAM:

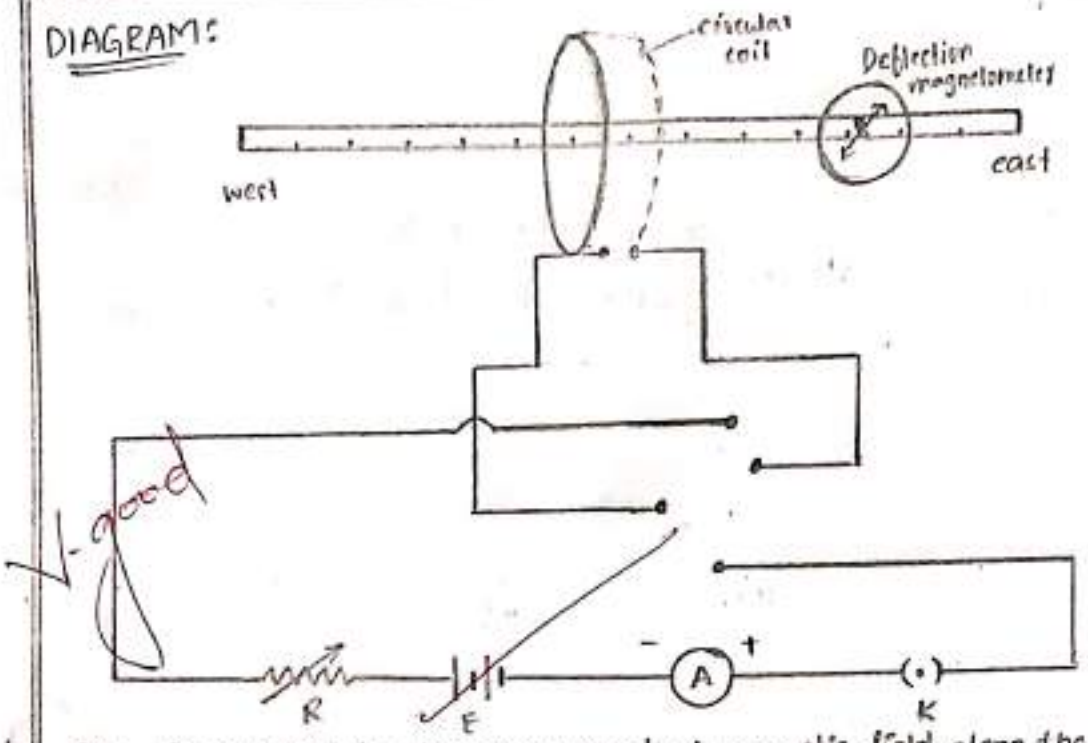
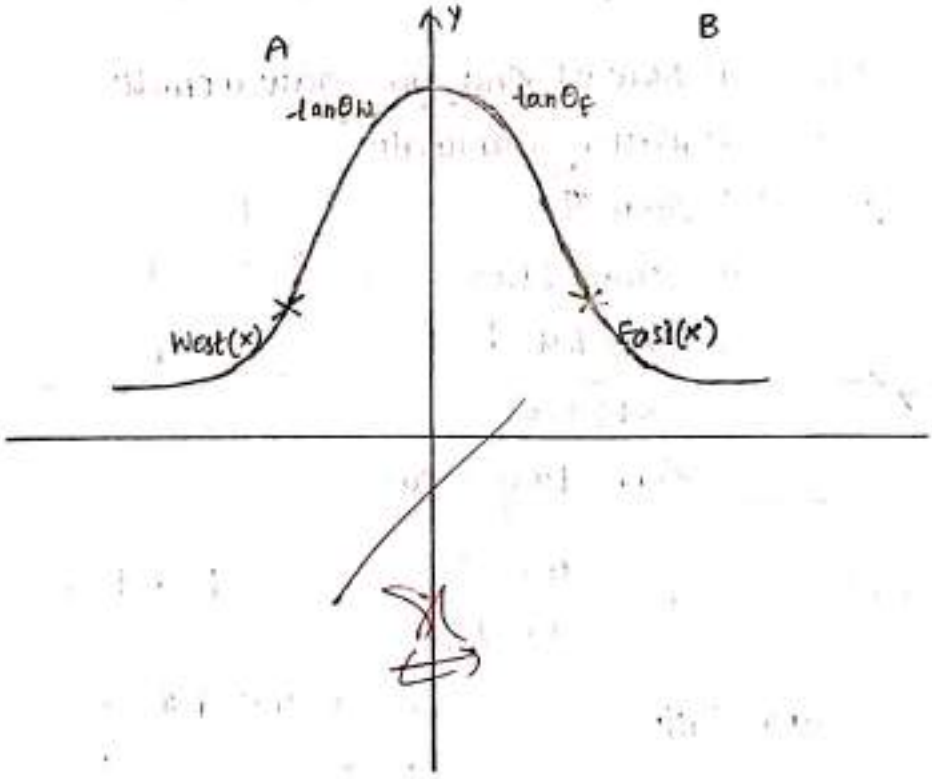


Fig.: Arrangement for the measurement of magnetic field along the axis of a current carrying coil.

MODEL GRAPH:



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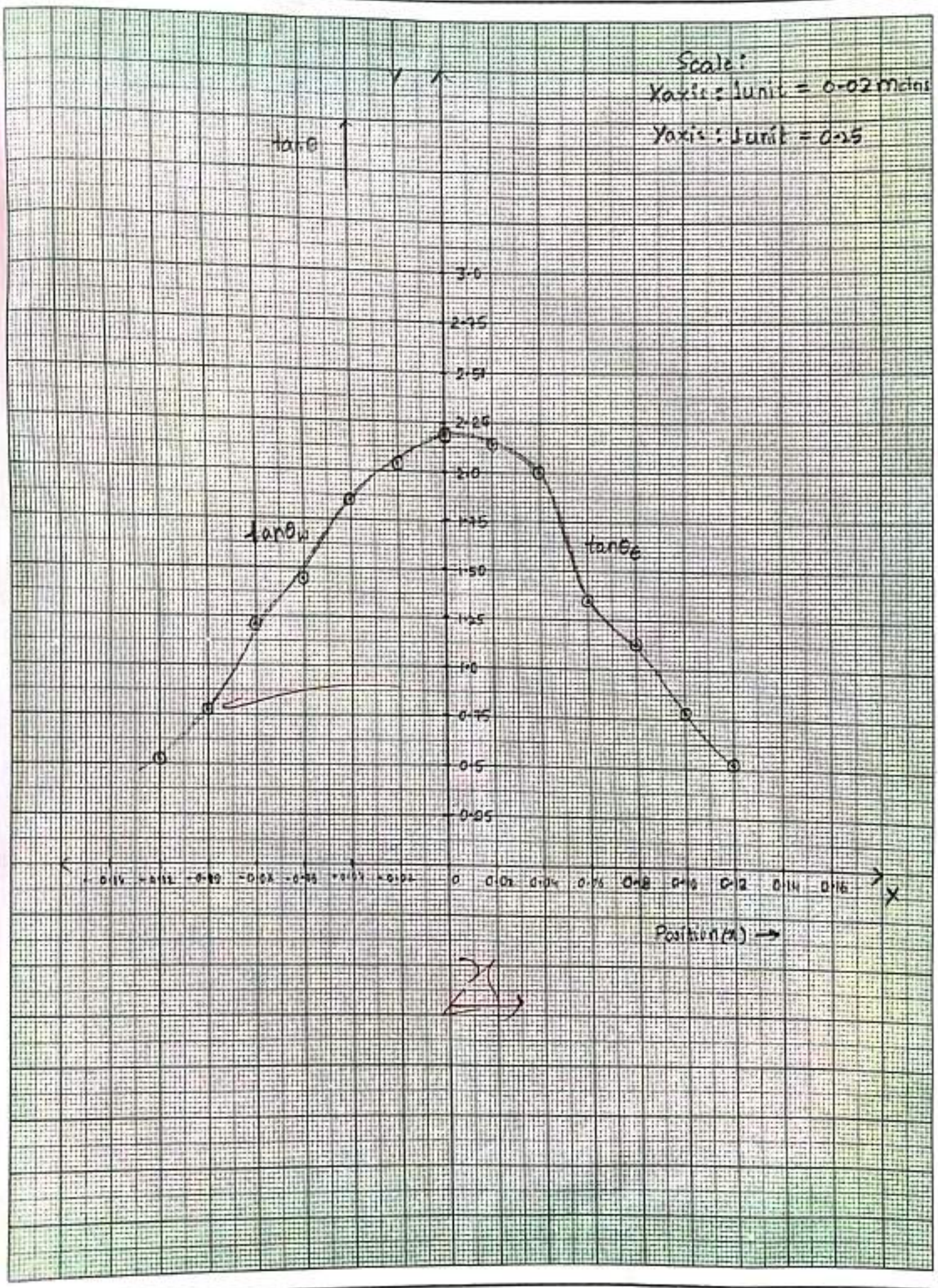

TABULAR FORM: $I = 0.84\,A$ $a = 10.15\,cm = 0.10\,m$ $n = 20$ $B_e = 0.38 \times 10^{-4}\,T$

S.No	Distance of deflection magnetometer from centre of the coil(x) in meters	Deflection in the magnetometer East side						Deflection in the magnetometer West side						$\theta = \frac{\theta_e + \theta_w}{2}$	$\tan\theta$	$B = B_e \tan\theta$	$B = \frac{4\pi n i a^2}{2(x^2+a^2)^{3/2}}$
		θ_1	θ_2	θ_3	θ_4	Mean θ_e	$\tan\theta_e$	θ_1	θ_2	θ_3	θ_4	Mean θ_w	$\tan\theta_w$				
1	0	60	60	72	72	66	2.24	60	60	72	72	66	2.24	66	2.24	8.512×10^{-5}	8.32×10^{-5}
2	0.02	60	60	70	70	65	2.14	59	59	70	70	64.5	2.09	64.75	2.12	8.058×10^{-5}	8.326×10^{-5}
3	0.04	62	62	65	65	63.5	2.00	58	58	64	64	61	1.80	62.25	1.90	7.22×10^{-5}	7.659×10^{-5}
4	0.06	55	55	51	51	53	1.32	55	55	54	54	54.5	1.40	53.75	1.36	5.168×10^{-5}	5.564×10^{-5}
5	0.08	52	52	45	45	48.5	1.13	46	46	45	45	50.5	1.21	49.5	1.17	4.446×10^{-5}	4.699×10^{-5}
6	0.10	40	40	36	36	38	0.78	35	35	40	40	37.5	0.76	37.75	0.77	2.926×10^{-5}	2.918×10^{-5}
7	0.12	30	30	28	28	29	0.55	28	28	30	30	29	0.55	29	0.55	2.09×10^{-5}	2.314×10^{-5}

RESULT : The theoritical & calculated values are approximately same.

VIVA VOCE :

1. Define magnetic field induction.

Magnetic field induction is the production of an electromotive force across an electrical conductor in a changing magnetic field.

2) Write units of magnetic field induction

Units of magnetic field induction are :

SI unit - Tesla &

Gaussian unit - guass ; 1T = 10,000G

3) State the principle behind the experiment.

To study the variations of magnetic field with distance along the axis of a circular current by Stewart and Gee's method putting a graph, where I is the current in ampere following the coil.

4) State Tangent law.

Tangent law states that, if a magnetic field 'B' is applied at right angles to the horizontal component of the earth's field B_H.

$$\tan\theta = \frac{B}{B_H}$$