"Education for Knowledge, Science and Culture"
-Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College (Empowered Autonomous), Kolhapur.

Department of Physics

B.Sc.-I Internal Evaluation Examination, Mar-2024

Subject Name: Electricity and Magnetism – I

Day and Date: Tuesday, 12-3-2024 **Time:** 10 AM

Marks (10)

Note:

1. All questions are compulsory
2. **Question 1** contains 2 questions 1 mark each
3. **Question 2** contains 2 questions 4 mark each
4. Answer the questions after carefully reading the text

Q. I. Select the correct alternatives (02)

1) The moving coil galvanometer is used for measurement of ....flows through the coil.

a) current b) charge

c) current density d) flux density

2) The magnetic field at a point along the axis of an infinitely long current carrying solenoid is

a) $\mu_0 nI$ b) $\frac{\mu_0 nI}{2}$

c) $\frac{\mu_0 nI}{4}$ d) $\frac{\mu_0 I}{2}$

Q. II. Answer the following questions (Any Two) (08)

1) What is the ballistic galvanometer? Explain the constants of B.G.
2) Derive an expression for the growth of charge in a circuit containing inductance (L) and Capacitor (C) and source of e.m.f in a series.
3) Explain the Biot-Savarts law.

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Vivekanand College, Kolhapur

(Empowered Autonomous)

Department of Physics

B. Sc. / ~~M.Sc.~~ Part – I **, Semester –** II **, PHYSICS Paper -**

Title of the Paper: Electricity & Magnetism.

Name of Teacher:

Date : 12/03/2024 **Attendance Sheet** (Internal Examination)

Sr. No.	Name of the Student	12-03-2024	Seat No.				
1)	Rushikesh. S. Raut.	[signature]	7211				
2)	Rupesh M. Nigade	[signature]	7260				
3)	Shreyas. S. Pawar	[signature]	7261				
4)	shreya. D. Athane	[signature]	7250				
5)	Divya A. Fadtare.	[signature]	7237				
6)	Sakshi B. Gaikwad	[signature]	7238				
7)	Krushna. B. Mane	[signature]	7242				
8)	Prem. M. Agrawal	[signature]	7201.				
9)	NIHAL R. SAYYAD	[signature]	7212				
10)	Amruta. D. Thombare	[signature]	7209				
11)	Parimal. C. Kadam	[signature]	7240				
12)	Arihant kiran Patil	[signature]	7234				
13)	Sahil shivaji Tonpe	[signature]	7235				
14)	Siddhant S. Banduke	[signature]	7226				
15)	Riya B. khade.	[signature]	7232				
16)	sumita S. Bharekar	[signature]	7236				
17)	Arpita B. Chougale.	[signature]	7228.				
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19)	Sumit. J. Dhabale	[signature]	7214				
20)	Sanchit K. Harge	[signature]	7230.				

21)	Shreya P. Patil.	Patil	7246			
22)	Prajwal K. Kamble.	[illegible]	7253			
23)	Vishal K Gorade	Vishal	7239			
24)	Prachi P. Mayekar	[illegible]	7233			
25)	Shravani Rajesh Pol	[illegible]	7247.			
26)	Gourav. G. Taple	Taple	7221			
27)	Kajal Baliram Sankpal	Sankpal	7248			
28)	Pratik A. Havale	[illegible]	7215			
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30)	Rushikesh .V. Shinde	[illegible]	7262			
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37)	Dinesh . D. Mane	Dmane	7259			
38)	Riya Pramod Patil	R.P.P	7220			
39)	Avadhut Shahaji Sutar	[illegible]	7208			
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Miss. Parimal Chandrashekhar Kadam

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10/10

Suppliment No. :

Subject : Electricity & Magnetism – I

Roll No. : 7240

Test / Tutorial No. :

Class : BSc-I (OE)

Div. :

Q.T.

1) b) charge

2) a) $\mu_0 n I$

02

Q.II.

1) Ballistic galvanometer is also called as moving coil galvanometer (M.C.G).

M.C.G. is used to measure the total charge flowing through.

Principle: 'A rectangular coil suspended in a magnetic field experiences torque as current flows through it.'

There are 4 constants of B.G

- Figure of merit
- Current sensitivity
- Voltage senstivity
- Charge sensitivity.

a) Figure of merit: The current (μA) required to produce deflection (mm) on a scale ~~of~~ + placed at 1m distance from the mirror of galvanometer.

If current I μA is required to produce deflection θ mm on a scale placed at 1m distance from mirror of galvanometer is $K = \frac{\theta}{I_g}$

Its unit is mm/μA.

b) Current sensitivity: The deflection (θ mm) produced by current (1μA) on a scale placed at 1m distance from mirror of galvanometer. It is reciprocal of figure of merit.

$S = \frac{I_g}{\theta}$

$\therefore$ Its unit is $\mu A/mm$

c) Voltage sensitivity:

The deflection (θ mm) produced by potential difference of $1 \mu V$ on a scale placed at 1m distance from galvanometer.

$\therefore$ Voltage sensitivity $= \frac{\theta}{G}$

$= \frac{\theta}{I_g . G}$ —— $\frac{\theta}{I_g} = K$.

$= \frac{K}{G}$

Its unit is ~~$\theta/\mu V$~~ $mm/\mu V$

d) Charge sensitivity:

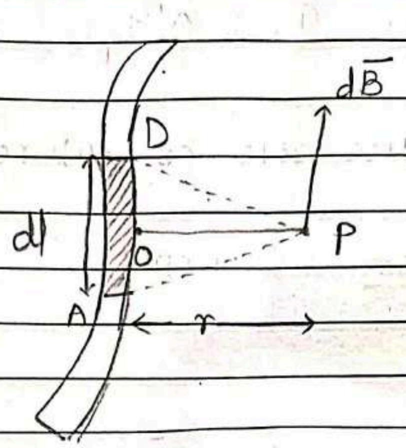
The deflection θ (mm) produced by $1 \mu C$ charge on a scale of ~~mov~~ galvanometer placed at 1m distance. Its unit is $mm/\mu C$

Charge sensitivity $= \frac{\theta}{q}$

$\therefore q = \frac{T}{2\pi} \cdot \frac{C}{nBA} \theta$.

$\therefore$ Charge sensitivity $= \frac{2\pi}{T} S$. —— S = Current sensitivity.

(3)



Biot Savarts law states that, 'The magnetic field at point P is directly proportional to

a) The length of element 'dl'

b) The current I flowing through it.

c) The sine angle between the ~~centr~~ element & the line joining the centre of the element to point P.

d) & is inversely proportional to square of distance of the line joining the centre of element O to P point.

$\therefore \; dB \propto \frac{I\,dl\,\sin\theta}{r^2}$

$\therefore \; dB = k\,\frac{I\,d\bar{l}\,\sin\theta}{r^2}$ — where value of k depends upon the medium in which it is placed.

For air or vacuum,

$k = \frac{\mu_0}{4\pi}$

where μ_0 = permeability of free space

$\therefore \; d\bar{B} = \frac{\mu_0}{4\pi}\,\frac{I\,d\bar{l}\,\sin\theta}{r^3}$ —— (1)

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Class : BSc - I (OE)

Signature of Supervisor

Subject : Electricity & Magnetism - I

Test / Tutorial No. :

Div. :

& in vector form,

$$d\bar{B} = \frac{\mu_0}{4\pi} \frac{I\, d\bar{l} \times \bar{r}}{r^3} \quad \text{---}(2)$$

The given equation is in vector form It is given by Flemings hand rule (right), The magnetic field $d\bar{B}$ is perpendicular to plane ADP

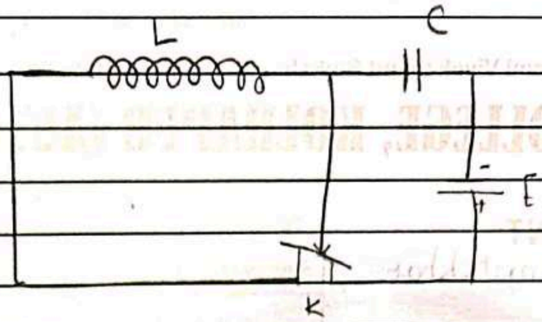
For total magnetic field we integrate the eq^n (2),

$$\therefore \int d\bar{B} = \int \frac{\mu_0}{4\pi} \frac{I\, d\bar{l} \times \bar{r}}{r^3}$$

$$\therefore B = \frac{\mu_0}{4\pi} \int \frac{I\, d\bar{l} \times \bar{r}}{r^3}$$

04

2)



Consider, an a pure inductance (L), condensor of capacity (C) connected in series with a battery of emf (E) & morse key (K)

When the key is closed current flows in the circuit through inductance & gets stored in the capacitance.
The equation of emf is,

$$E = L\frac{di}{dt} + \frac{q}{C} \quad \text{--- (1)}$$

$$\therefore \frac{E}{L} = \frac{di}{dt} + \frac{q}{LC}$$

$$\therefore \frac{di}{dt} = i = \frac{dq}{dt}.$$

$$\therefore \frac{E}{L} = \frac{d^2q}{dt^2} + \frac{q}{LC}$$

$$\therefore \frac{d^2q}{dt^2} + \frac{q}{LC} - \frac{EC}{LC} = 0$$

$$\therefore \frac{1}{LC} = k^2$$

$$\therefore \frac{d^2q}{dt^2} + k^2q - k^2EC = 0$$

$\therefore \frac{d^2q}{dt^2} + k^2(q - EC) = 0$

$\therefore \frac{d^2q}{dt^2} + k^2 x = 0$ —— $(q - EC) = x$

—— $\frac{d^2q}{dt^2} = \frac{d^2x}{dt^2}$

$\therefore d^2x/dt^2 + k^2 x = 0$ —— (2)

$\therefore$ The above eq^n (2) is of form $(D^2 + k^2)x = 0$

$\therefore D^2 = -k^2$

$\therefore D = \pm ik.$

$\therefore$ ~~B~~ sol^n of eq^n is,

$x = Ae^{ikt} + Be^{-ikt}$

$x = A[\cos kt + i\sin kt] + B[\cos kt - i\sin kt]$

$\therefore q - EC = (A + B)\cos kt + (A - B)\, i\sin kt.$

$\therefore A + B = G,\ i(A - B) = H.$

$\therefore q = EC + G\cos kt + H\sin kt$

$EC = q_0$

$\therefore q = q_0 + G\cos kt + H\sin kt.$ —— (3)

$i = \frac{dq}{dt}$

$\therefore i = 0 - Gk\sin kt + Hk\cos kt$ —— (4)

For $t=0$, $q=0$

Eqⁿ (3) $\Rightarrow$ $G = -q_0$

For $t=0$, $i=0$

Eqⁿ (4) $\Rightarrow$ $H=0$, $k \neq 0$.

$\therefore$ Eqⁿ (3) $\Rightarrow$ $q = q_0 - q_0 \cos kt$

$$q = q_0(1-\cos kt) \quad \text{—— (5)}$$

$\therefore$ Eqⁿ (4) $\Rightarrow$ $i = q_0 k \sin kt$ —— (6)

Eqⁿ (5) shows simple harmonic motion. Therefore it oscillates by q_0 & time period is given by

$T = \frac{2\pi}{k}$

64 $= 2\pi\sqrt{LC}$ —— $k^2 = \frac{1}{LC}$

Eqⁿ (6) shows that its oscillates with amplitude $q_0 k$ time period is given by

$\therefore T = 2\pi\sqrt{LC}$

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VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Signature of Supervisor: $\frac{10}{10}$

Suppliment No. : 1

Subject : Physics (Mechanism)

Roll No. : 7237

Test / Tutorial No. :

Class : BSC-I

Div. : A

Q.1

1) ~~b)~~ b) Charge

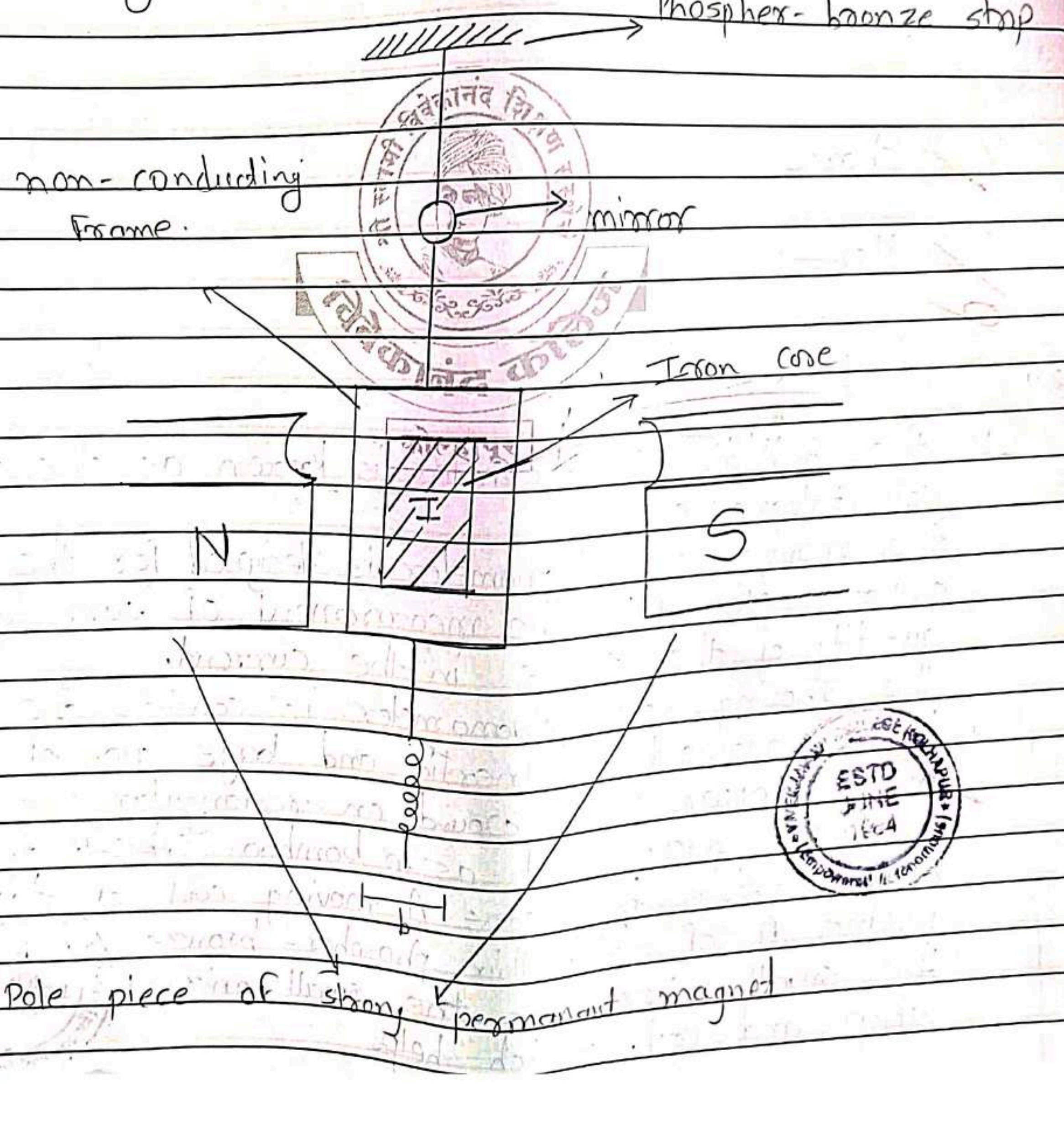
2) b) $\mu_0 n I$.

Q.2

1) the Ballistic Galvanometer is known as the moving coil Galvanometer.
the moving coil galvanometer is designed for the galvanometer for the measurement of ~~curr~~ total quantity of the charge in the current.
the moving coil galvanometer is consists the ~~to~~ large moment of Inertia and large no. of terms ~~in~~ of copper Toon around on rectangular non-conducting wire such as ~~a~~ bomboo. ~~The A phospher-bronze~~ ~~strip by means~~ A moving coil of strip by means ~~A~~ of ~~stri~~ thin phospher-bronze ~~the small mirror is the small mirror~~ is attached ~~strip and coil. which helps~~

The Iron core is attached to the strip. in the strip is in the form of Helix. the small mirror is attached to the strip and coil. which helps to the measurement of galvanometer by lamp scale galvanometer Iron core is placed inside the non-conducting frame.

due to magnetic field, the plane of coil is always remains parallel to the magnetic Induction. the whole arrangement is the metallic case and glass of window at the base and levelling screw at the base.



Constants of B.G:

1) Figure of merit.

the current (~~m~~ μA) is required produces a ~~deq~~ deflection (mm) on a scale kept at a distance 1m from the mirror of galvanometer.
It's unit of galvanometer 0mm on a scale kept at distance from the mirror of the galvanometer.

Figure of merit $= \frac{\mu A}{mm} \frac{I_g}{\theta}$

It's unit is $= \frac{\mu A}{mm}$

2) Current of sensitivity.

the deflection (mm) produced by the current (μA) on a scale kept at a distance 1m from the mirror of the galvanometer.
It is denoted by 'S'. The the current of sensitivity is the reciprocal of figure of merit.

Current of sensitivity $= S = \frac{\theta}{I_g}$

It's unit is $= \frac{mm}{\mu A}$.

3) Voltage sensitivity:
The deflection (mm) produced by the potential difference across the galvanometer on a scale

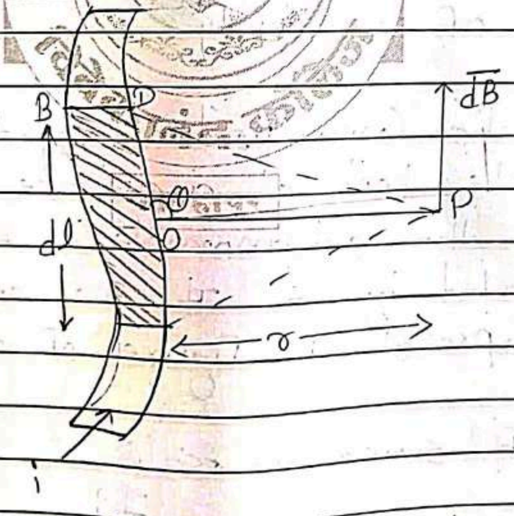
kept at a distance 1m from the mirror of galvanometer.

~~F~~ voltage sensitivity $= \frac{\theta}{Vg} = \frac{\theta}{I_g G_c} = \frac{S'}{G_c}$

4) ~~Cu~~ charge sensitivity:

The ~~charge de~~ corrected deflection (mm) produced by the charge (1μV) on a scale kept at a distance 1m from the mirror of galvanometer.

3) Biot - savarts law



Biot-savarts law is state that the magnetic field due to the ~~charge~~ current it's flow in the circuit. it is the inversaly proportional to the
i) the length of the current
ii) the current i flow through it conductor.
iii) the line joining the centre of element at the point P.

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Suppliment No. : 2

Subject : physics

Roll No. : 7237

Test / Tutorial No. :

Class : BSc-I

Div. : A

iv) the square of the distance (r^2) from the point P ~~to~~ at the O.

$$dB = \frac{I\,dl\,dr}{r^2}$$

$$\therefore dB = K\frac{I\,dl\,dr}{r^2} \quad \text{--- (1)}$$

where, the value of $K = \frac{\mu_0}{4\pi}$.

Put the value $K = \frac{\mu_0}{4\pi}$ in the eq^n (1).

$$dB = \frac{\mu_0}{4\pi}\int\frac{I\,dl\,dr}{r^2}$$

the μ_0 is the permibility of the free space.

$$dB = \frac{\mu_0}{4\pi}\int\frac{I\,dl\,dr}{r^2}$$

In vector form.

$$\overline{dB} = \frac{\mu_0}{4\pi}\int\frac{I\,d\overline{l}\times\overline{r}}{r^3}$$

the total Biot - savarts law is

$$\boxed{B = \frac{\mu_0}{4\pi} \frac{I\,dl \times \bar{r}}{r^3}}$$

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Prachi Pundlik Mayekar

Suppliment No. : 1

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Signature of Supervisor

$\frac{10}{10}$

Subject : Physics

Test / Tutorial No. :

Div. : A

Q.1

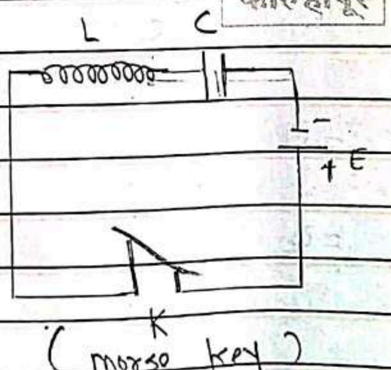
1] b) current density charge

2] a) $\mu_0 n I$

Q.2

2]

→ Ans :–



(morse key)

In the curcuit Inductance 'L', condenser of capacity 'C' are connected in series with the battery (E). A special type of key is connected in the circuit called morse key (K).

When the morse key is closed the charges flowing throught Inductance and it is stored by condenser 'c'.

q and i will be the instantanious charge and current will be developed.

The e.m.f of the cuircuit is,

$$E = L\frac{di}{dt} + \frac{q}{C} \quad -(1)$$

where,

$$i = \frac{dq}{dt}$$

$$L\frac{d^2q}{dt^2} + \frac{q}{C} - E = 0$$

$$\frac{d^2q}{dt^2} + \frac{q}{LC} - \frac{E}{L} = 0$$

-- (Divided by L b.s)

then we know,

$$\frac{1}{LC} = K^2 \quad \text{and} \quad \frac{E}{L} = \frac{EC}{LC} = K^2 EC$$

then above eq^n

$$\frac{d^2q}{dt^2} + K^2 q - K^2 EC = 0$$

$$\frac{d^2q}{dt^2} + (q - EC) K^2 = 0$$

Let $q - EC = x$

diff w.r.t t above eq^n becomes

$$\frac{dq}{dt} = \frac{dx}{dt}$$

$$\frac{d^2q}{dt^2} = \frac{d^2x}{dt^2}$$

-- (again diff w.r.t t)

$$\frac{d^2x}{dt^2} + k^2 x = 0 \quad -(2)$$

Above eq^n in the form of operator.

$(D^2 + k^2)\, x = 0$

$D^2 + k^2 = 0$

$D^2 = -k^2$

$D = \pm ik$

$x = Ae^{ikt} + Be^{-ikt}$

$q - EC = Ae^{ikt} + Be^{-ikt} \quad -- (x = q - EC)$

$q - EC = A(\cos kt + i\sin kt) + B(\cos kt - i\sin kt)$

$q - EC = (A+B)\cos kt + i(A-B)\sin kt$

Let,

$A + B = G$ and $i(A-B) = H$

putting in above eq^n

$q = EC + G\cos kt + H\sin kt$

$q = q_0 + G\cos kt + H\sin kt \quad -(3) -- (q_0 = EC)$

$\dot{i} = 0 - Gk\sin kt + Hk\cos kt$

$i = -Gk\sin kt + Hk\cos kt \quad -(4)$

To find the value of G and H put $q = 0$ and $t = 0$ in the eq^n (3)

$q = q_0 + G + 0$

$G = -q_0$

and to find the value G and H put $i = 0$ and $t = 0$ in eq^n (4)

$0 = 0 + HK$

$HK = 0$

where,

$H = 0$ and $K \neq 0$

$G = -q_0$ put in eqⁿ (3) and (4)

$q = q_0 - q_0 \cos Kt$

$$\boxed{q = q_0(1 - \cos Kt)} \quad -(5)$$

$$\boxed{i = q_0 K \sin Kt} \quad -(6)$$

Eqⁿ (5) is eqⁿ of simple harmonic motion. It gives that the charge is depends upon the amplitude of q_0 and time required for the Osciallation.

$$T = \frac{2\pi}{K}$$

$$\boxed{T = 2\pi\sqrt{LC}}$$

Equation (6) it is the current is depends upon the amplitude of the $q_0 K$ and time required for the osciallation is

Time period(t) = $\boxed{2\pi\sqrt{LC}}$

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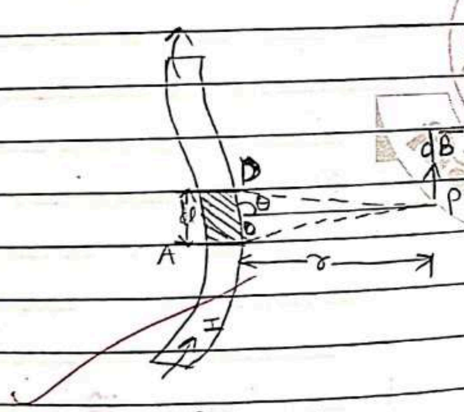
Suppliment No. : 2	Signature of Supervisor
Roll No. : 7233	Subject : Physics
Class : BSCI (OE)	Test / Tutorial No. :
	Div. : A

3]

→ Ans:—



The Biot-Savarts law states that, " The magnetic field dB deliling at the point 'P' due to current carrying eliment is depends upon,

i) The current carring throught element 'I'

ii) length of the small element 'dl'

iii) Angle θ betn the point 'P' and the middle point 'o' of the element.

iv) It inversely propertional to the length square betn the point P and the element

$$dB \propto \frac{I dl \sin\theta}{r^2}$$

$$dB = K \frac{I dl \sin\theta}{r^2}$$

where,
K = is the propertinality quantent
value of k is depends upone the midiuem where the condenser is placed.
for the Air or vaccum value of k is

$$K = \frac{\mu_0}{4\pi}$$

$$dB = \frac{\mu_0}{4\pi} \frac{I dl \sin\theta}{r^2}$$

Biot - Savarts law in vector from is

$$dB = \frac{\mu_0}{4\pi} \frac{I \vec{dl} \times \vec{r}}{r^3} \quad \text{--- (1)}$$

It is eqⁿ the magnetic field at 'P' due to small element, then the magnetic field at 'P' due to intiere current carring conducter is,
Intigrate the above eqⁿ,

$$\int dB = \int \frac{\mu_0}{4\pi} \frac{I d\overline{l} \times \overline{r}}{r^3}$$

$$\boxed{B = \frac{\mu_0}{4\pi} \int \frac{I d\overline{l} \times \overline{r}}{r^3}}$$

Name: Amruta Dhanaji Thombare.

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Roll No. : 7209	Test / Tutorial No. :
Class : BSc fy	Div. :

Q.1 Select the current alternatives.

1. The moving coil galvanometer is used for measurment of charge flows through the coil.

→ b) charge

2. The magnetic field at a point along the axis of an infinite long current carrying solenoid is $\mu_0 n I$

→ a) $\mu_0 n I$.

Q.II. ~~Ans~~ Answer the following questions.

1). What is the ballistic galvanometer? Explain the Constants of B.G.

→

Ballistic galvanometer is also called as moving coil galvanometer ('M.C.G)

MCG is used to measure the total charge flowing through

Principle: 'A ~~rectangular~~ rectangular coil suspended in a magnetic field experiences tourque as current flows through it.

Their is 4 constant of B.G

1) figure of Merit
2) Current sensitivity
3) voltage sensitivity
4) charge sensitivity.

a) figure of Merit :- The current (μA) required to produce deflection (mm) on a scale placed at 1m distance.

if current 1 μA is required to produced deflection θ mm on a scale placed at 1m distance from mirror of galvanometer is $K = \frac{I\theta}{Ig}$ Its unit is mm/μA

b) current sensitivity: The diflection (θ mm) produced by current (1 μA) on a scale placed at 1m distance from mirror of glavanometer. Its reciprocal of figure of merit. $S = \frac{Ig}{\theta}$

Its unit is μA/mm

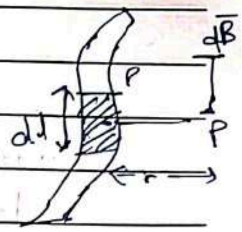
c) voltage sensitivity: The deflection (θ mm) produced by potential diffrence of 1 μV on a scale placed at 1m distance from galvanometer.

$$\text{voltage sensitivity} = \frac{\theta}{G} = \frac{\theta}{Ig \cdot G} \quad \text{---} \quad \frac{\theta}{Ig} = K$$

$$= \frac{K}{G}$$

The unit is. = mm/μV

3) Explain the Biot - Savarts law.



→ Biot-savarts law states that 'The magnetic field at point P is directly proportional to the

a) The length of element dl
b) The current flowing 'P'P' through it.
c) The ~~sinee~~ angle between the element of the line joining the centre of element to the point P

is inversly proportional to square of distance of the line ~~joing~~ joining the centre of element O to P point

$$\therefore dB \propto \frac{I dl \sin\theta}{r^2}$$

$$\therefore dB = K \frac{I d\bar{l} \sin\theta}{r^2}$$ where value of K depends upon the medium in which it is placed.

for air or vaccum.

$$K = \frac{\mu_0}{4\pi}$$

where μ_0 = permeability of free space

04

$$\therefore d\bar{B} = \frac{\mu_0}{4\pi} P \frac{d\bar{l} \sin\theta}{r^3} \quad \text{— ①}$$

& in vector form,

$$d\bar{B} = \frac{\mu_0}{4\pi} \frac{I d\bar{l} \times \bar{r}}{r^3} \quad \text{— ②}$$

The given condition in vector form it is given by fleming ~~a~~ right hand The magnetic field ~~dB~~ db is perpendicular to playing ADP

∴ Total magnetic field is given by

$$\int d\bar{B} = \frac{\mu_0}{4\pi} \int \frac{I\, d\bar{l} \times \bar{r}}{r^3}$$

"Education for Knowledge, Science and Culture"
-Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College (Empowered Autonomous), Kolhapur.

Department of Physics

B.Sc.-I Internal Evaluation Examination, Mar-2024

Subject Name: Electricity and Magnetism – II

Day and Date: Thursday, 14-3-2024 **Time:** 10 AM

Marks (10)

Note:

1. All questions are compulsory
2. **Question 1** contains 2 questions **1** mark each
3. **Question 2** contains 2 questions **4** mark each
4. Answer the questions after carefully reading the text

Q. I. Select the correct alternatives **(02)**

1) Del being a vector, its dot product with vector function gives ....

   a) scalar function b) vector function

   c) zero d) unity

2) The volume integral of the divergence of a vector function F over a closed volume V is always equal to the .... of F over the closed surface S enclosing that volume.

   a) surface integral b) volume integral

   c) line integral d) 1

Q. II. Answer the following questions (Any Two) **(08)**

1) Explain Line, Surface and Volume Integral.
2) Give the statements of Stoke's theorem and Green's Symmetrical theorem.
3) Explain Divergence of Vector Field.

Shri Swami Vivekanand Shikshan Sanstha, Kolhapur's

Vivekanand College, Kolhapur

(Empowered Autonomous)

Department of Physics

B. Sc. / M.Sc. Part – I, Semester – II, PHYSICS Paper - II Section II

Title of the Paper: Electricity and Magnetism - II (Internal Examination)

Name of Teacher: Dr. N. A. Narewadikar.

Attendance Sheet Date: 14/03/2024

Sr. No.	Name of the Student	Seat No	Sign				
1)	Divya A. Fadtare	7237	Fadtare	10			
2)	Kajal B. Sankpal.	7248	Sankpal	10			
3)	Dinesh D. Mane	7259	Mane	09			
4)	NIHAL R. SAYYAD	7212	Sayyad	10			
5)	Rushikesh S. Raut	7211	Raut	06			
6)	Vishal K. Gorade	7239	[illegible]	09			
7)	Shreyas. S. Pawar	7261	Pawar	08			
8)	Prem. M. Agrawal	7201	[illegible]	08			
9)	Karan. A. Bhosale	7213	[illegible]	08			
10)	Sakshi B. Gaikwad	7238	Gaikwad	09			
11)	Shital S. Patil	7245.	[illegible]	09			
12)	Sumita S. Bharenkar	7236	Bharenkar	08			
13)	Riya Pramod Patil	7220	R.P.P.	07			
14)	Parimal. C. Kadam	7240	PKadam	10			
15)	Amruta. D. Thombare	7209.	Athombare	05			
16)	Shreya. D. Athane	7250	SDAthane	06			
17)	Shreya P. Patil	7246	Patil	08			
18)	Sumit J. Dhabale	7214	S.J.Dhabale	09			
19)	Prachi P. Mayekar	7233	[illegible]	10			
20)	Krushna. B. Mane	7242	Bmane	09			

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21)	Siddhant S. Banduke	7226	Siddhant	09			
22)	Sahil . S. Tonare	7235	S.Stonare	07			
23)	Shravani . R. Pol	7247	Shravani	10			
24)	Riya . B. khade	7232	Riya	09			
25)	Arpita B. Chougale	7228	Bhale	08			
26)	Prasad . D. Khabale	7219	D.Khabale	05			
27)	Rupesh m. Nigade	7260	RNigade	05			
28)	Gourav . G. Taple	7221	Gtaple	05			
29)	Pratik . A. Havale	7215	PHavale	05			
30)	samiksha . R. Bhajanawale	7227	SAM	05			
31)	Prathamesh . B. Khopkar	7257	[illegible]	05			
32)	SurajKumar . S. Mahto	7258	Suraj	05			
33)	Shravang B. Kamble.	7241	[illegible]	05			
34)	Sanchit L. Harge	7230	SHarge	05			
35)	Prajwal k. kamble.	7253	[illegible]	10			
36)	Arihant kiran Patil	7234	Patil	10			
37)	Avadhut Ghataji Sutar	7208	[illegible]				
38)	Rushikesh Vinayak shinde	7262	[illegible]				
39)							
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45)							
46)							
47)							
48)							
49)							

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SUPPLIMENT Name:- Sankpal Kajal Baliram		Signature of Supervisor	
Suppliment No. :		Subject : Electricity & Magnetism - II	
Roll No. : 7248	10/10	Test / Tutorial No. : Internal	
Class : B.SC. I		Div. : A	

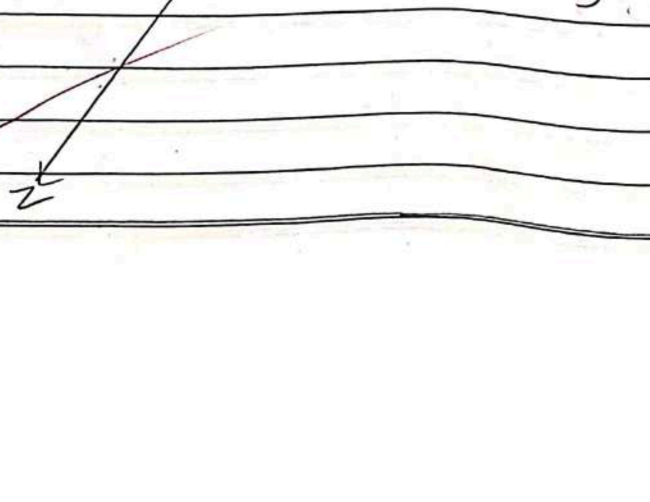
Q. I 1) a) Scalar function.

2 c) ~~Line~~ integral.

2. a) Surface integral

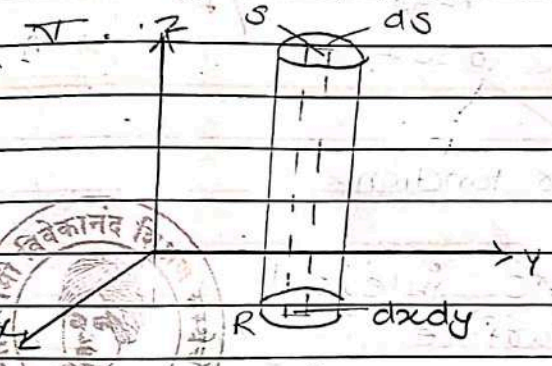
Q. II 1). Surface Integral :-

Let S is a surface in vector space. there is small element are $\vec{ds} = \hat{n}\, ds$ where $\hat{n}$ is unit normal vector Integral is drawn as the vector field.



2. Stoke's theorem :-

If ~~state~~ the $\overline{F}$ be the vector function. It is uniform finite & continuously along with it's derivative in any closed surface, then the line integral of volume ∇.



2. Green's theorem :-

It is green ~~th~~ symmetrical thereom is cam tendendent corrollary of the course divergence theorem. It is expressed in two different term.
If ψ and ϕ is two scalar function of positive with condinuous within a certain reason of bounded by a surface s bounding of at the volume in the term

$$\phi \psi \frac{\partial \phi}{\partial n} ds = \iint_{s} [\psi \nabla^2 \phi + \nabla \epsilon \psi \nabla \phi] dv - ①$$

Greens theorem in second term

$$\phi [\psi \frac{\partial \phi}{\partial n} - \phi \frac{\partial \psi}{\partial x}] dx = \iint [\psi \nabla^2 \phi - \phi \nabla^2] dv - ②$$

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3. Divergence of vector field :-

The vector function (or field) is $\phi(x, y, z)$ is $\frac{\partial\phi}{\partial x}dx + \frac{\partial\phi}{\partial y}dy + \frac{\partial\phi}{\partial z}dz$ is called as vector divergence of vector field. It is a dot product.

where $(\nabla\phi) = d\bar{r}$.

$d\bar{r} = \hat{i}\frac{\partial\phi}{\partial x} + \hat{j}\frac{\partial\phi}{\partial y} + \hat{k}\frac{\partial\phi}{\partial z} \quad (\hat{i}dx + \hat{j}dy + \hat{k}dz)$.

$\hat{i}\frac{\partial\phi}{\partial x} + \hat{j}\frac{\partial\phi}{\partial y} + \hat{k}\frac{\partial\phi}{\partial z}$ ---

$\hat{i}dx + \hat{j}dy + \hat{k}dz$

then for infinitesimal integral is called differential $dx.dy.dz$ the total differential of ϕ is

$\phi = (\hat{i}\frac{\partial\phi}{\partial x} + \hat{j}\frac{\partial\phi}{\partial y} + \hat{k}\frac{\partial\phi}{\partial z}$ — (1)

we can write

$d\phi = \left(\hat{i}\frac{\partial\phi}{\partial x} + \hat{j}\frac{\partial\phi}{\partial y} + \hat{k}\frac{\partial\phi}{\partial z}\right)(\hat{i}dx + \hat{j}dy + \hat{k}dz)$

$d\phi = (\nabla\phi)\,d\bar{r}$ — (2)

$d\phi = \text{grad}\,\phi\,d\bar{r}$ — (3)

Divergence of vector $(\nabla\phi$ in the vector quality.

- Line Integral :-

The curve OA is the point curve. let a curve at a point p in the curve. consider a small element displacement $\overline{dl}$ in the curve at p.

$\overline{V} \cdot \overline{dl} = P \cdot dl \cos\theta$

$= (\overline{V} \cos\theta)\, dl$

= product of componet of an along dl with magnitude of displacement of

If $\overline{V}$ is the force $\int \overline{V} \cdot \overline{dl}$ dW = work done in displacement.

If vector $\overline{P}$ cchange from point to the point in the displacement from O to A is called as line Intergra of $\overline{V}$ along OA.

- Volume Integral :-

The volume integral of the divergence of vector function.

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VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

SUPPLIMENT

Name: Arihant Kiran Patil

Suppliment No. : 1+1=2.

Roll No. : 7234

Class : B.Sc. I

Signature of Supervisor

Subject : Physics.

Test / Tutorial No. : Date: 14/3/24 10/10

Div. : A

Q.1. 1. a. Scalar Function

Q2 2. a. surface integral.

Q.2. B. Divergence of Vector Field [$\bar{\nabla} \cdot \bar{V}$].

When a vector quantity can be asined to every point in space, the space is called as vector field.

eg. Electric field, Magnetic field

The flux of vector field through an area element $d\bar{s}$ is the scalar product of area vector to given vector $\bar{V}$.

$$\text{flux through } ds = \phi = \phi \cdot ds$$

$$= \phi \cdot \hat{n} \cdot ds$$

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where, $\hat{n}$ is the unit normal vector to the area element ds.

Definition:

If $\bar{V} = \hat{i} V_x + \hat{j} V_y + \hat{k} V_z$ is the continuously differentiable in the field, then the divergence of vector $\bar{V}$ is the scalar product of del operator with $\bar{V}$.

$$\therefore (\bar{\nabla} \cdot \bar{V}) = \left[\hat{i}\frac{\partial}{\partial x} + \hat{j}\frac{\partial}{\partial y} + \hat{k}\frac{\partial}{\partial z}\right]\left[\hat{i} V_x + \hat{j} V_y + \hat{k} V_z\right]$$

$$= \hat{i}\hat{i}\frac{\partial V_x}{\partial x} + \hat{i}\hat{j}\frac{\partial V_y}{\partial x} + \hat{i}\hat{k}\frac{\partial V_z}{\partial x}$$
$$+ \hat{j}\hat{i}\frac{\partial V_x}{\partial y} + \hat{j}\hat{j}\frac{\partial V_y}{\partial y} + \hat{j}\hat{k}\frac{\partial V_z}{\partial y}$$
$$+ \hat{k}\hat{i}\frac{\partial V_x}{\partial z} + \hat{k}\hat{j}\frac{\partial V_y}{\partial z} + \hat{k}\hat{k}\frac{\partial V_z}{\partial z}$$

$\therefore$ It is clear that,

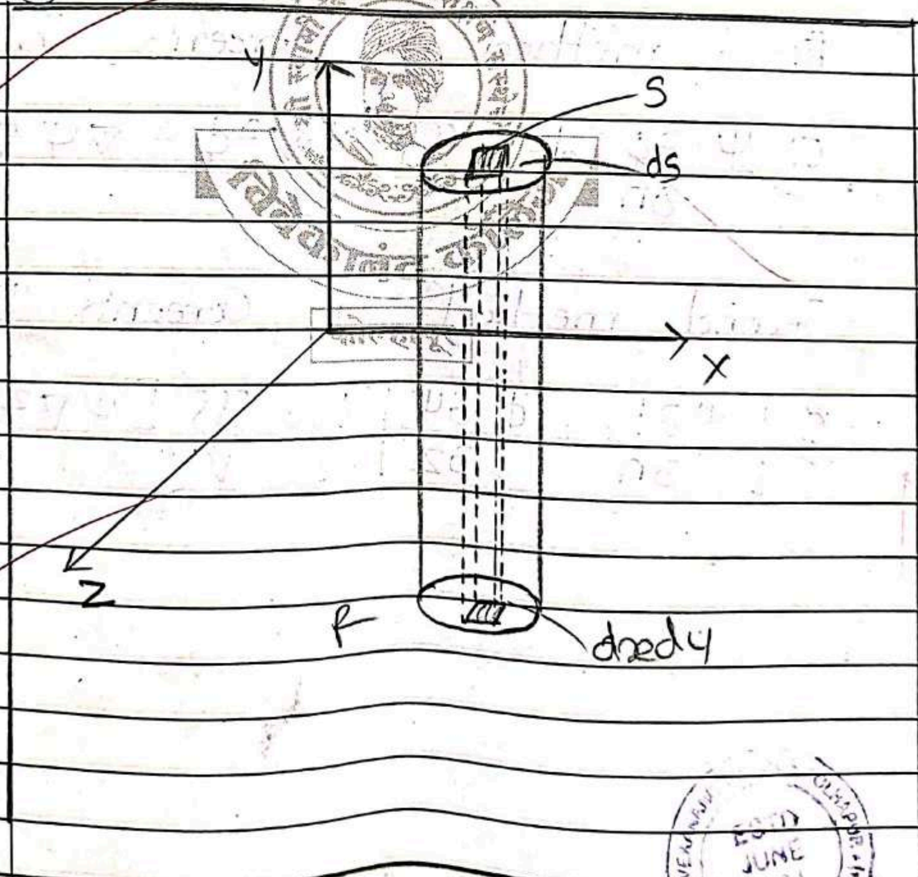
$$(\bar{\nabla} \cdot \bar{V}) = \frac{\partial V_x}{\partial x} + \frac{\partial V_y}{\partial y} + \frac{\partial V_z}{\partial z}$$

$\therefore$ The Divergence of vector $(\bar{\nabla} \cdot \bar{V})$ is the scalar quantity.

2. i. Stoke's Theorem:

It is states that, If $\bar{F}$ is vector function which is uniform, finite and continuous along with it's derivative in any direction. Then the tangential line integral of $\bar{F}$ over any closed surface S bounded by a curve C is equal to the normal surface integral of the curl $\bar{F}$ over S.

$$\oint_S \bar{F} \cdot d\bar{l} = \iint [\bar{\nabla} \times \bar{F}] \, ds.$$



ii. Green's Symmetrical Theorem

Green's theorem is an important corollary gauss divergence theorem. It is commonly expressed by two different forms.

If ψ and ϕ be two scalar function in position with continuous derivative within a certain region bounded by a abousred (surface S bounding the volume V.

First method of Green's Th^m:

$$\oiint \psi \frac{\partial \phi}{\partial n} ds = \iiint_V [\psi \nabla^2 \phi + \nabla \psi \nabla \phi] dv$$

Second method of Green's Th^m:

$$\oiint \left[\psi \frac{\partial \phi}{\partial n} , \phi \frac{\partial \psi}{\partial z} \right] ds = \iiint_V [\psi \nabla^2 \phi - \phi \nabla^2 \psi] d$$

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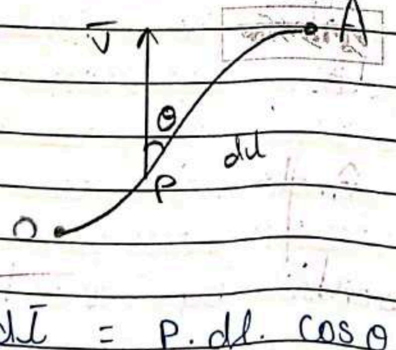
SUPPLIMENT

Signature of Supervisor	
Suppliment No. : 1	Subject : Physics
Roll No. : 7234	Test / ~~Tutorial No.~~ : Date : 14-3-24
Class : B.Sc. I	Div. : A

1. i) line Integral.

If Consider a curve OA in the vector Field. Let, $\bar{v}$ be the vector at point P on the curve consider a small ~~area~~ elementry displacement vector $d\bar{l}$ ~~along~~ along the curve at P.



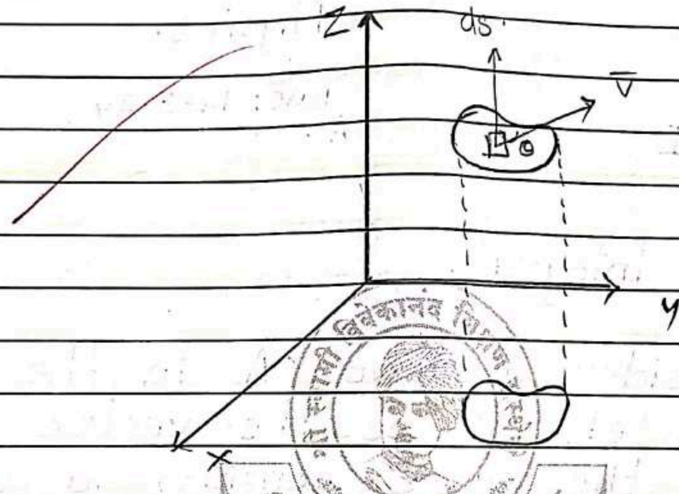
$\bar{v} = d\bar{l} = P.dl.\cos\theta = (\bar{v}\cos\theta)\,dl.$

If $\bar{v}$ is the force $= \bar{v}.dv.$

The vector $\bar{v}$ chaining from point to point then it's all total products are $\int_{0}^{A}\bar{v}.dv$ to displacement from O to A is called as line Integral.

Surface Integral

Let, S be the Surface of in vector space consider a small area element $d\bar{s} = \hat{n}.ds$ where, $\hat{n}$ is the unit normal vector drawn on area element ds.



Let, $\bar{V}$ be the vector then the Surface integral over the $\bar{V}$ is

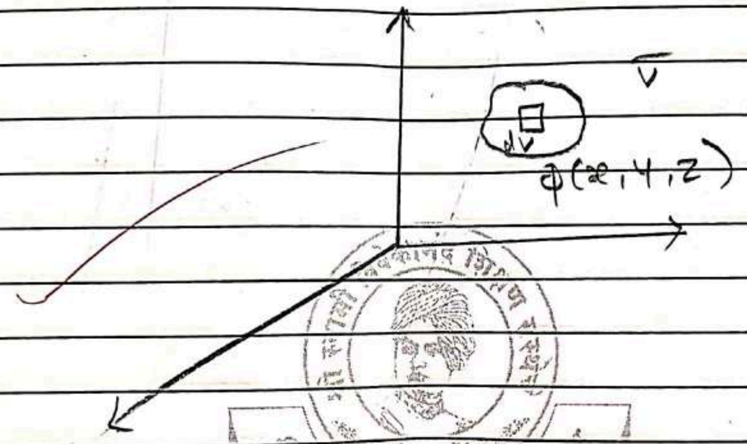
$$= \iint_V \bar{V} . d\bar{s}$$

$$= \iint_V \bar{V} . \hat{n} . ds$$

$\therefore$ It is represents by a double integration

Volume Integral:

If $\phi(x, y, z)$ is a scaler point fu^n a given point in the space. consider. an infitesinaly a small volume element $dv = dx\,dy\,dz$. at this point as shown in fig.



The v. I over the volume v is defined as $\iiint$. namely $\iiint \phi . dv$.

In perticular ϕ in expressed as divergens of vector Fun^n

i.e. $\phi = \bar{\nabla} . \bar{V}$.

then volume Integral over volume

$v = \iiint \bar{\nabla} . \bar{V} . dv$

where,

$dv = dx\,dy\,dz$

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SUPPLIMENT

Name - Prajwal kiran kamble.

Suppliment No. :	Signature of Supervisor
Roll No. : 7253 10/10	Subject : Electricity & Magnetism - II
Class : BSC FY	Test / Tutorial No. :
	Div. :

Q. 1) Del being a vector, its dot product with vector function gives scalar function.

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Q. II

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$$= \hat{i}\hat{i}\frac{\partial v_x}{\partial x} + \hat{i}\hat{j}\frac{\partial v_y}{\partial x} + \hat{i}\hat{k}\frac{\partial v_z}{\partial x}$$

$$+ \hat{j}\hat{i}\frac{\partial x}{\partial y} + \hat{j}\hat{j}\frac{\partial v_y}{\partial y} + \hat{j}\hat{k}\frac{\partial v_z}{\partial y}$$

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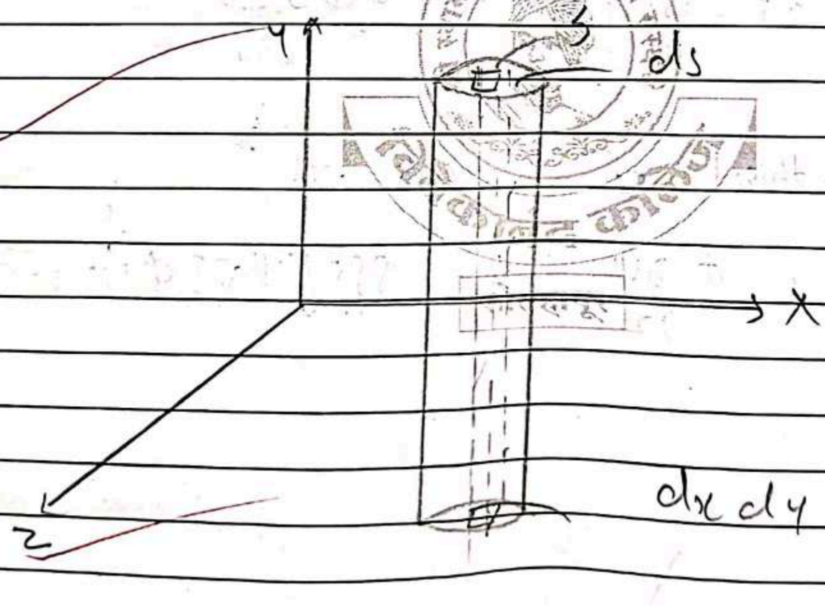

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04