Iqra National University

Final Term Paper (Online)

Subject Name: Applied Physics
Class: BS SE-1, CS-1
Instructor: M Khalid Hamid

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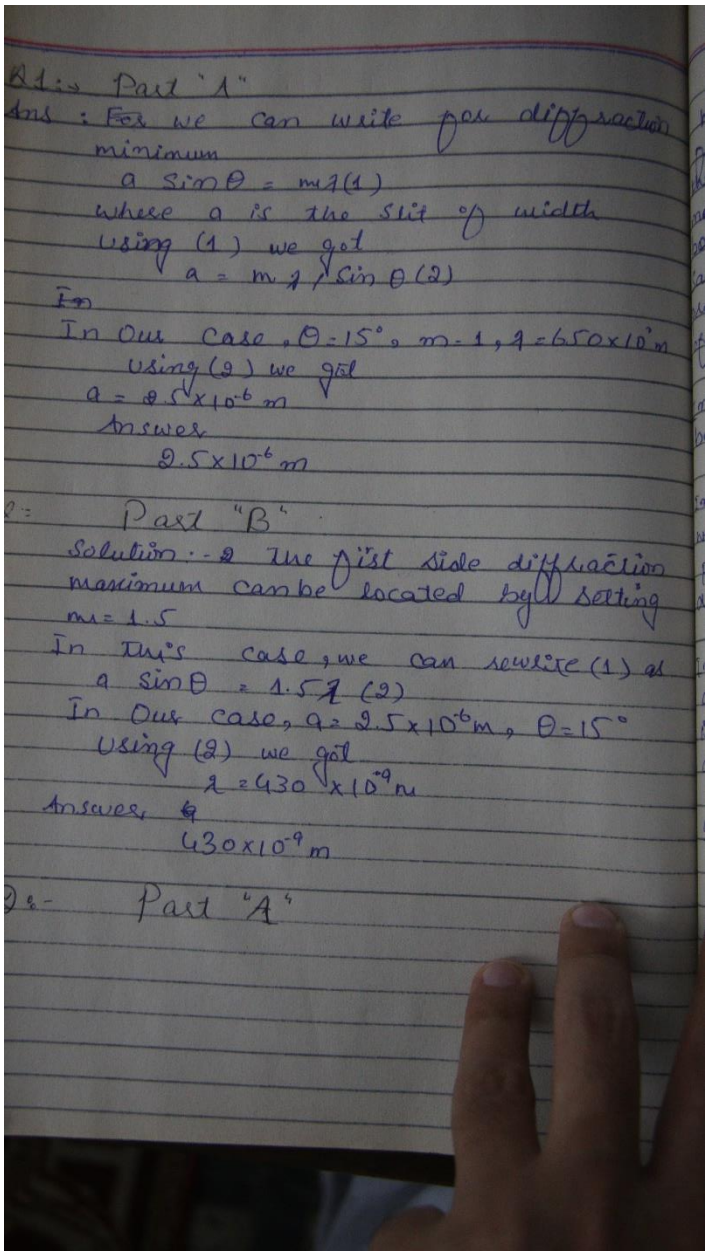
Note: Attempt all questions in your own handwriting and then send it only through university portal.

Q1: A slit of width α is illuminated by white light.

a. For what value of α will the first minimum for red light of wavelength λ = 650 nm appear at θ = 15°?
b. What is the wavelength λ' of the light whose first side diffraction maximum is at 15°, thus coinciding with the first minimum for the red light?

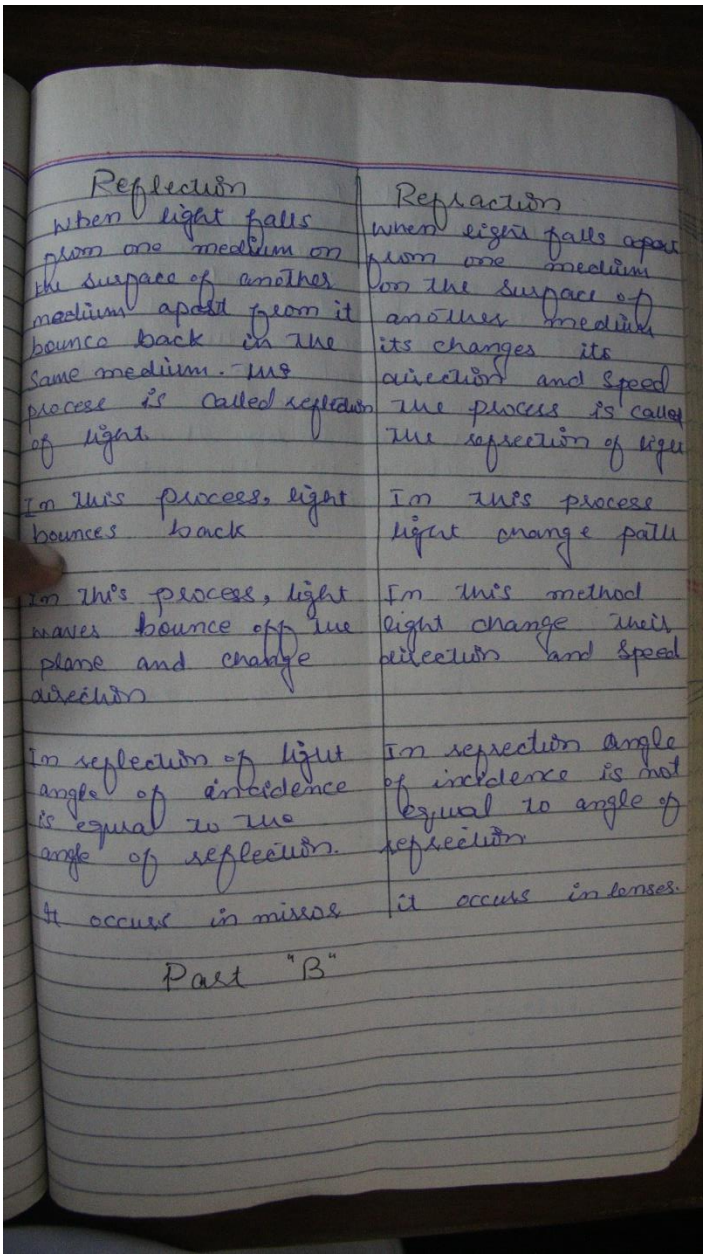
Ans:



Q2:

a. What is the difference between reflection and refraction?
b. Explain the difference among angle of incident, angle of reflection and angle of refraction with the help of formulae and a single diagram?

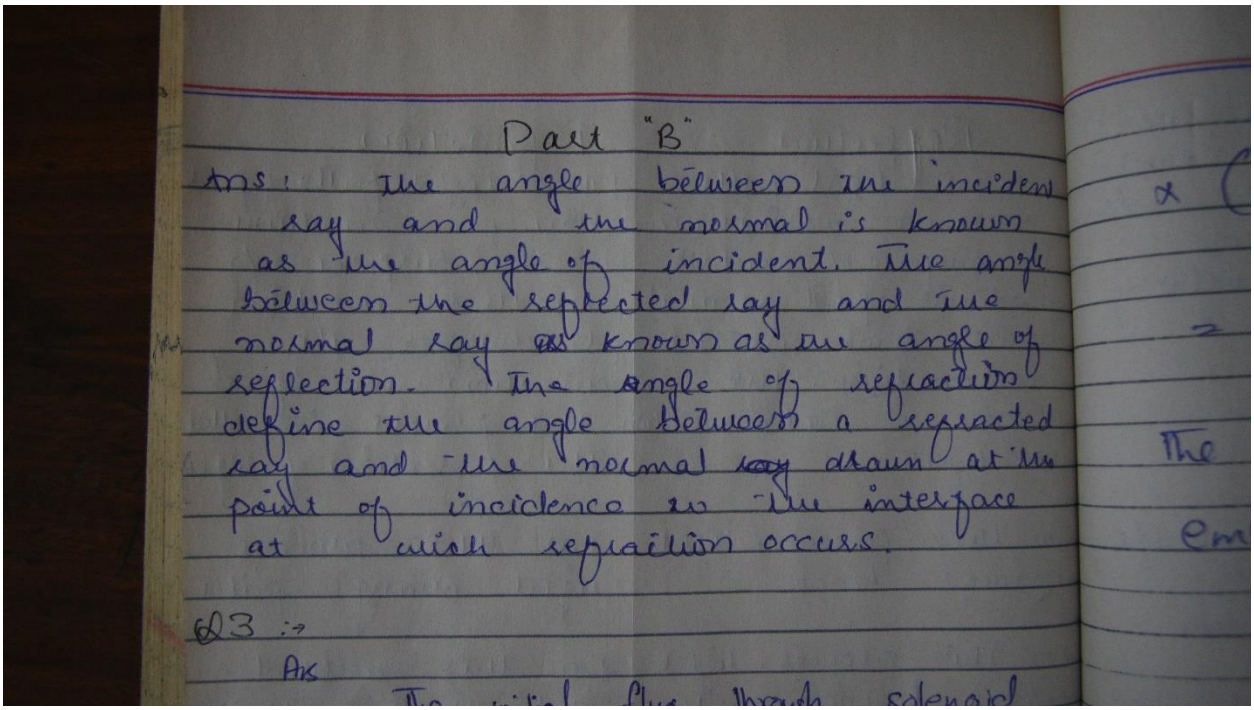
Ans Part A



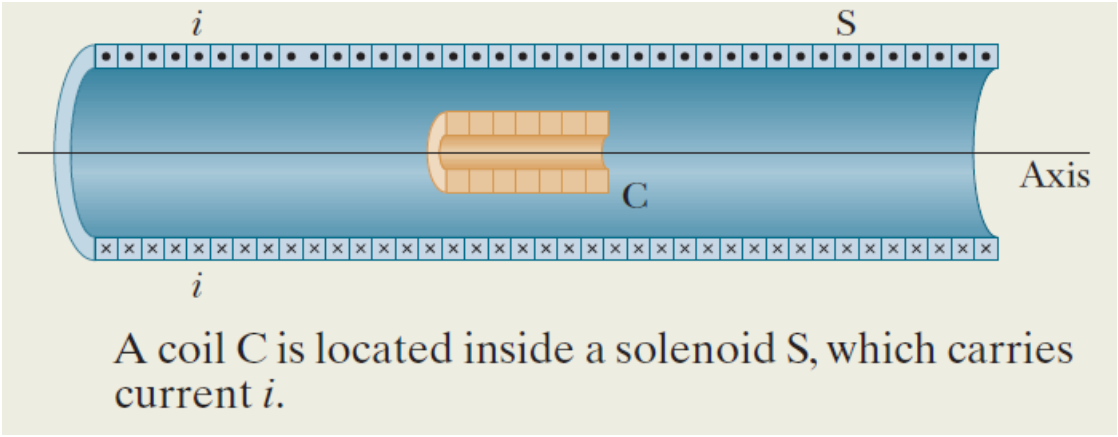
Reflection	Refraction
When light falls from one medium on the surface of another medium apart from it bounce back in the same medium. This process is called reflection of light.	When light falls apart from one medium on the surface of another medium its changes its direction and speed The process is called the reflection of light
In this process, light bounces back	In this process light change path
In this process, light waves bounce off the plane and change direction	In this method light change their direction and speed
In reflection of light angle of incidence is equal to the angle of reflection.	In reflection angle of incidence is not equal to angle of reflection
It occurs in mirror	it occurs in lenses.

Part "B"

Part B

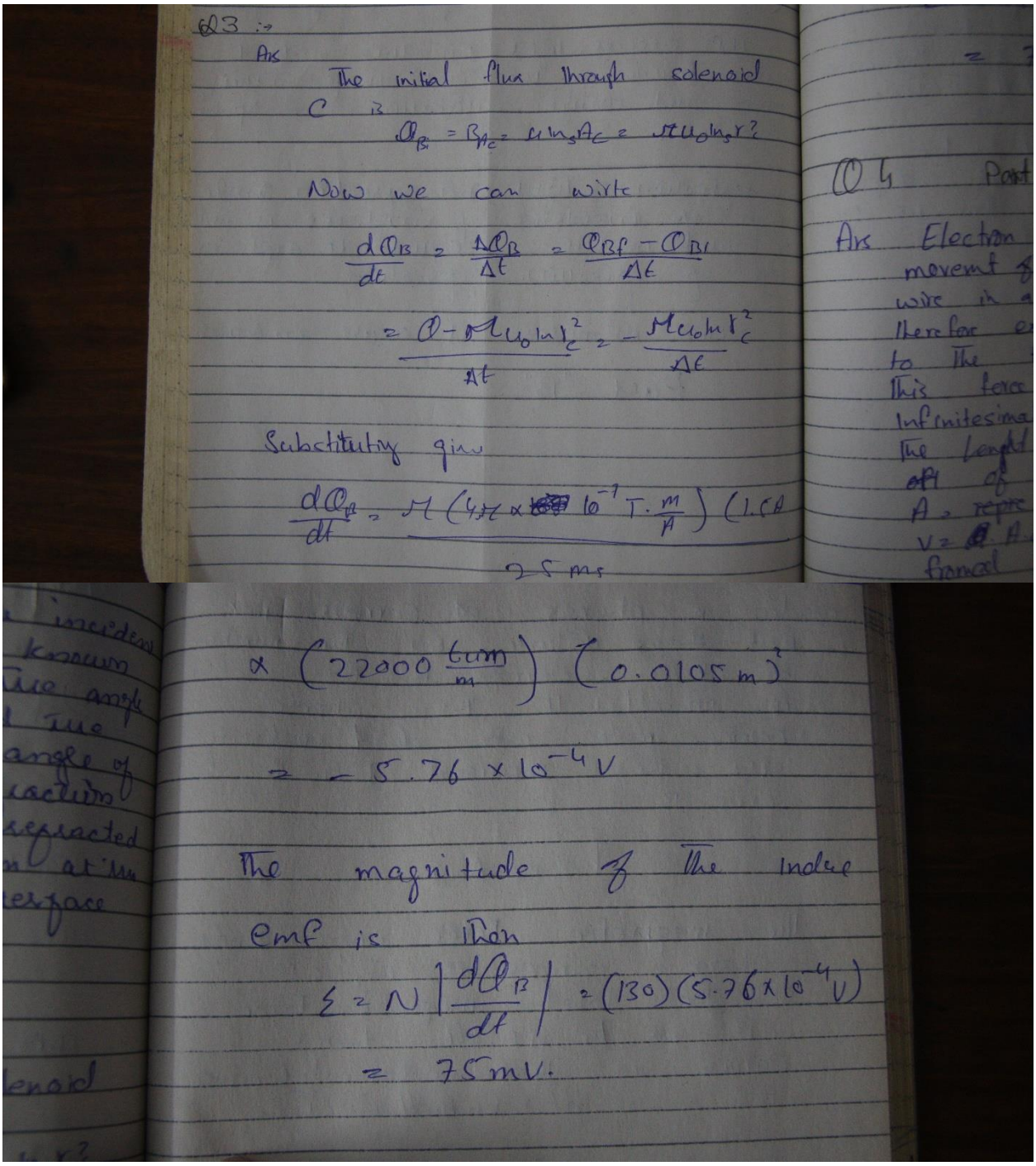


Q3: The long solenoid S shown (in cross section) in the following diagram has 220 turns/cm and carries a current *i* = 1.5 A; its diameter D is 3.2 cm. At its center we place a 130-turn closely packed coil C of diameter d = 2.1 cm. The current in the solenoid is reduced to zero at a steady rate in 25 ms. What is the magnitude of the emf that is induced in coil C while the current in the solenoid is changing?



A coil C is located inside a solenoid S, which carries current *i*.

Ans:

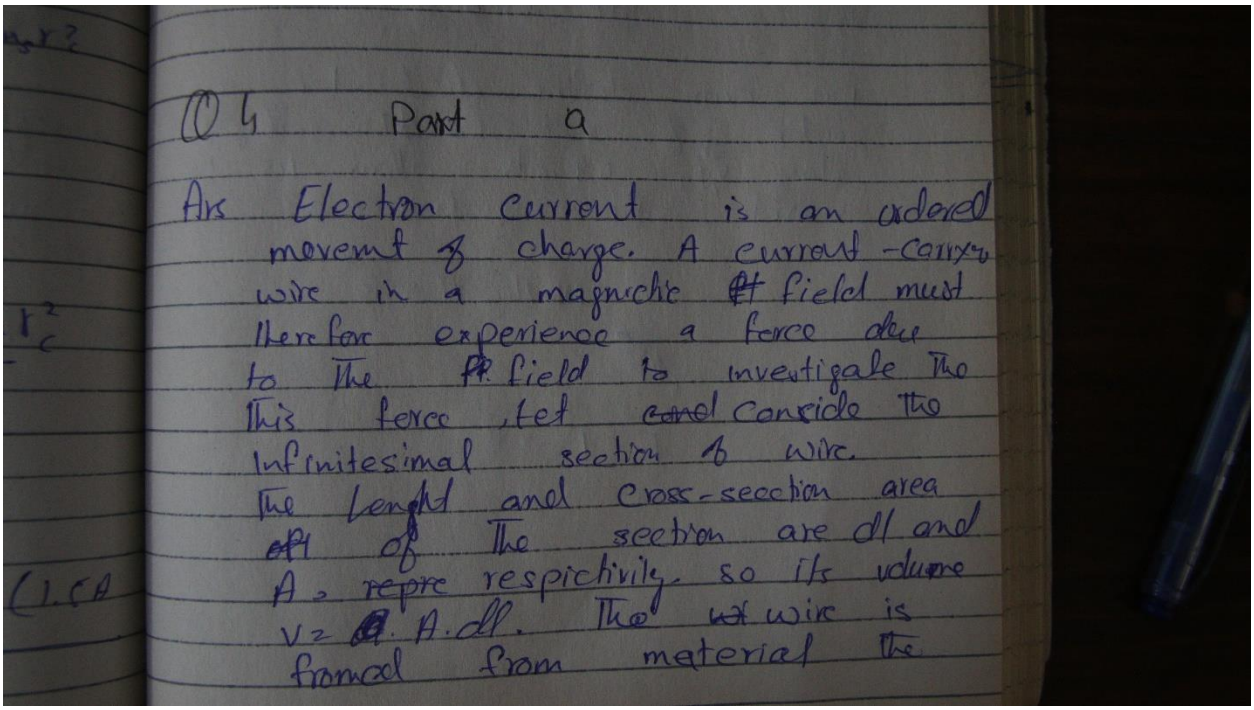


Q4:

a. How to calculate the magnetic force on current carrying wire?

b. A straight, horizontal length of copper wire has a current i = 28 A through it. What are the magnitude and direction of the minimum magnetic field B needed to suspend the wire, that is, balance the gravitational force on it? The linear density (mass per unit length) of the wire is 46.6 g/m.

Ans:



Q4 Part a

Ans Electron current is an ordered movement of charge. A current-carrying wire in a magnetic field must therefore experience a force due to the field to investigate the this force, let consider the infinitesimal section of wire. The length and cross-section area of the section are dl and A, respectively. so its volume $V = A \cdot dl$. The wire is formed from material the

Contain n charges ~~ch~~ carriers per unit ~~charge~~ volume. so the number of charge carriers in the section is $nA \cdot dl$. If the charge carries move with drift velocity $\vec{v_d}$ the current I in the wire is

$$I = ne A v_d$$

The magnetic Force any single charge carries is $e\vec{v}_d \times \vec{B}$ so the total magnetic Force $d\vec{F}$ on the $nA \cdot dl$ charge carries in the section of wire is

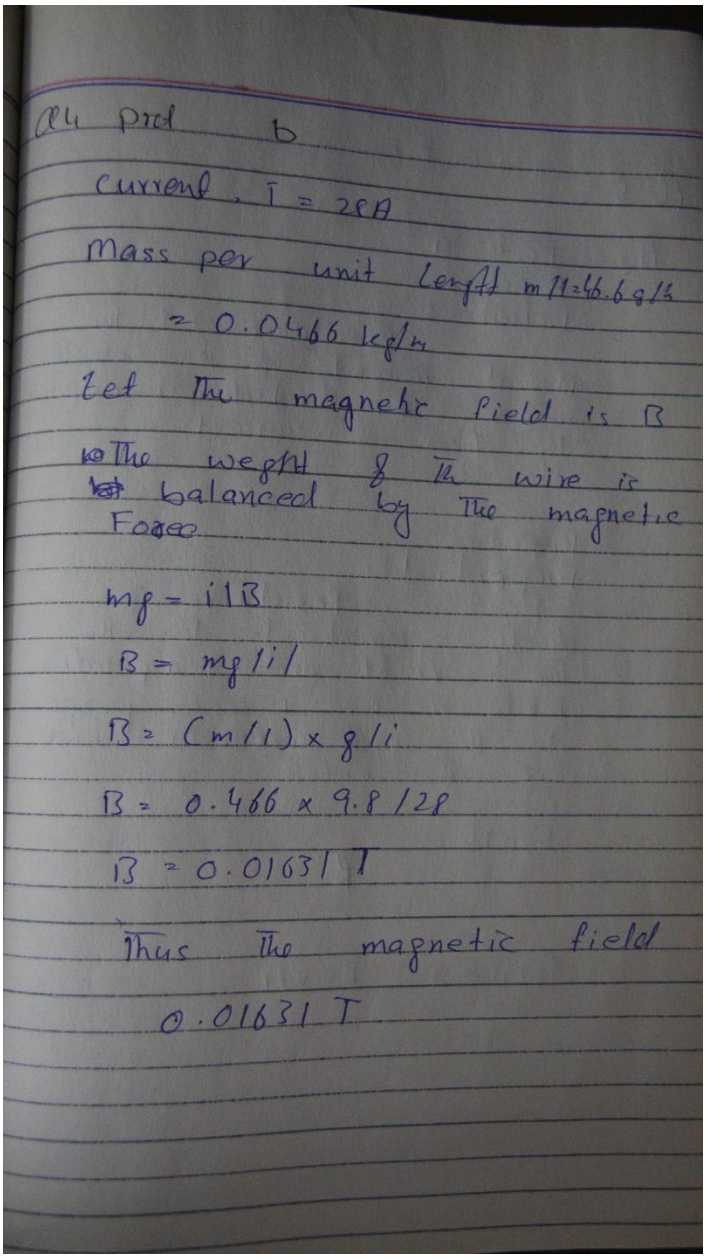
$$d\vec{F} = (nA \cdot dl) e\vec{v} \times \vec{B}.$$

we can define dl to be a vector of ~~leg~~ length dl point along $\vec{v}_d$, which allow us to rewrite the equation as

$$d\vec{F} = n e A v_d \, d\vec{l} \times \vec{B}$$

$$\vec{F} = I\vec{l} \times \vec{B}$$

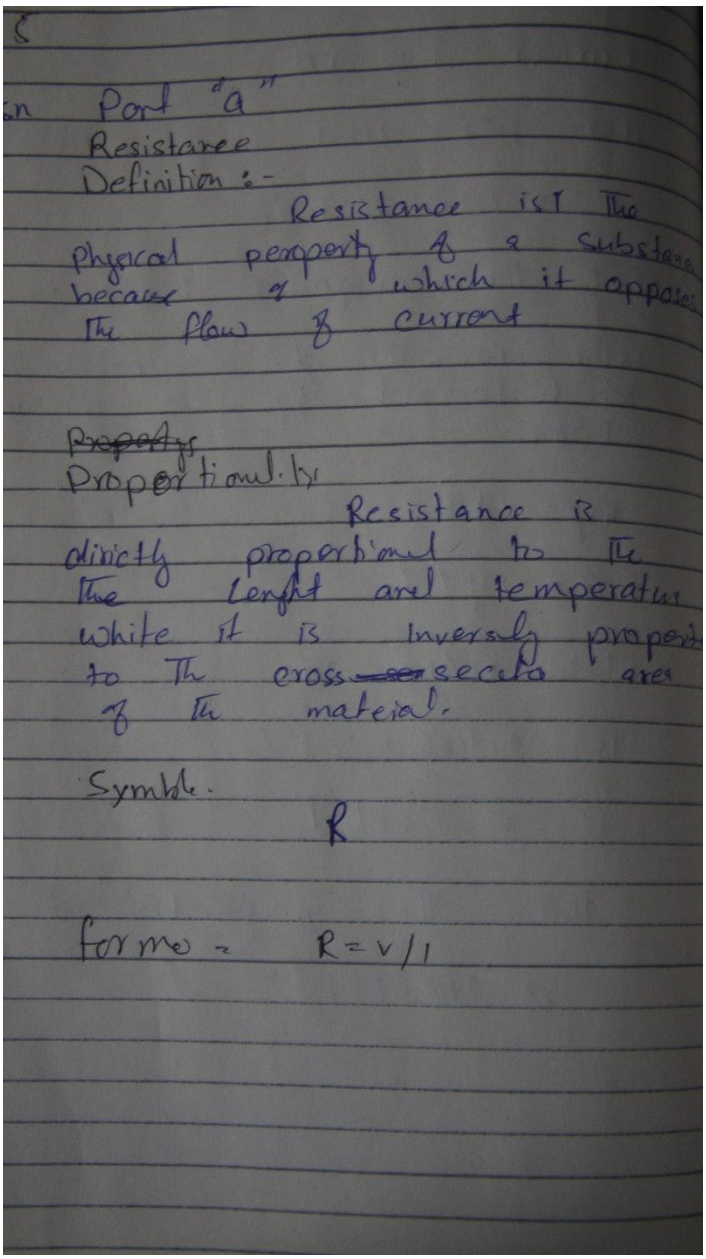
Part B



Q5:

a. What is the difference between Resistance and Resistivity?
b. A rectangular block of iron has dimensions 1.2 cm x 1.2 cm x 15 cm. A potential difference is to be applied to the block between parallel sides and in such a way that those sides are equipotential surfaces as shown in the following diagram. What is the resistance of the block if the two parallel sides are
   (1) the square ends (with dimensions 1.2 cm x 1.2 cm)
   (2) two rectangular sides (with dimensions 1.2 cm x 15 cm)?

Ans :



Part "a"

Resistance

Definition :-

Resistance is the physical property of a substance because of which it opposes the flow of current

~~Property~~

Proportionality

Resistance is directly proportional to the the length and temperature while it is inversely proportional to the cross ~~section~~ section area of the material.

Symbol.

R

formula = $R = V/I$

Resistivity

Definition:-

Resistivity is phys property of particular substance which is having particular dimensions.

Properties:-

Resistivity is only proportional to the natural and temperature of the particular meterial.

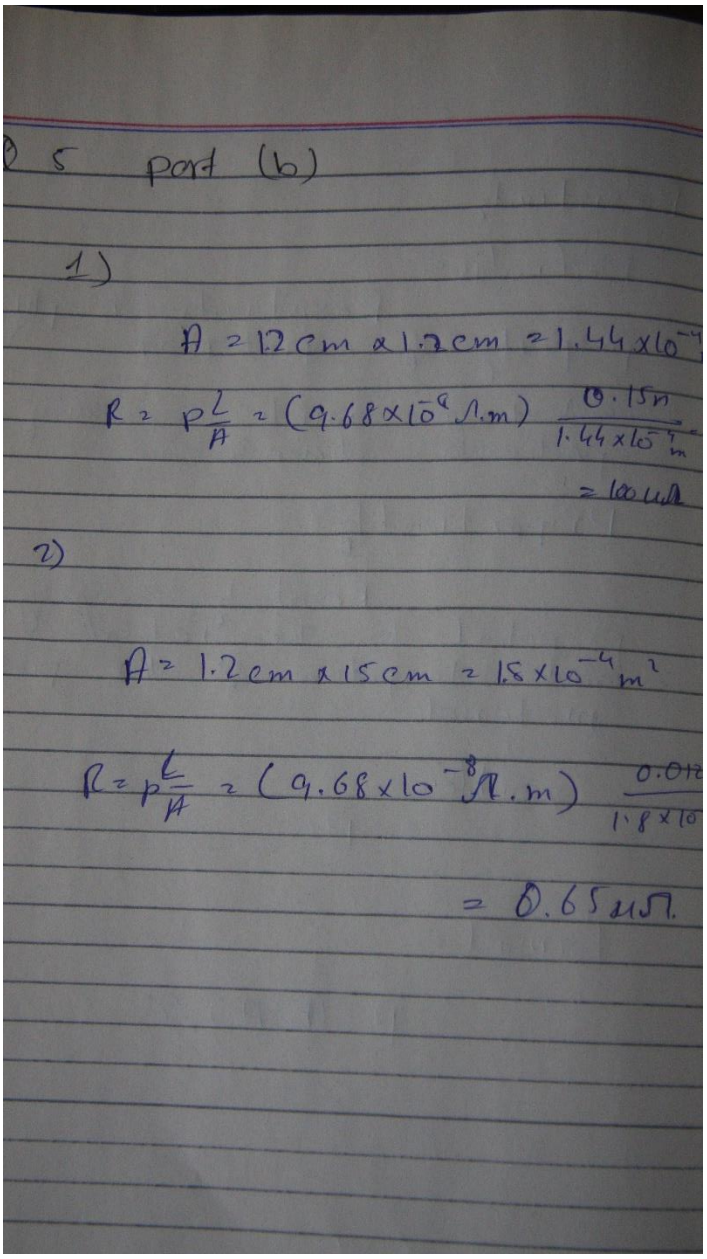
Symbol:-

ρ

formal:-

$\rho = (R \times A) / l$

Part B



5 part (b)

1)

$A = 1.2\,cm \times 1.2\,cm = 1.44 \times 10^{-4}$

$R = \rho \frac{L}{A} = (9.68 \times 10^{-8}\,\Omega.m)\ \frac{0.15\,m}{1.44 \times 10^{-4}\,m}$

$= 100\,\mu\Omega$

2)

$A = 1.2\,cm \times 15\,cm = 1.5 \times 10^{-4}\,m^2$

$R = \rho \frac{L}{A} = (9.68 \times 10^{-8}\,\Omega.m)\ \frac{0.01}{1.8 \times 10}$

$= 0.65\,\mu\Omega.$