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UNIVERSITY OF CALCUTTA

ADMIT

B.Sc. SEMESTER - III (HONOURS) Examination-2021

(UNDER CBCS)

Name of the Candidate :

SOHINI MITRA

Father's/Guardian's Name :

KAUSIK MITRA

Roll & No. :

203013-11-0055

Registration No.

013-1211-0226-20

Subjects Enrolled :

PHSA,CEMG

Name of the College :

GOKHALE MEMORIAL GIRLS' COLLEGE

Sohini Mitra

SCHEDULE FOR EXAMINATION IN THEORETICAL PAPERS **

Examination Day & Date		Examination Starting Time	Subject Code ++	Course Code	Course Name	Number of Answer book(s) to be used	Signature of the invigilator on receipt of the answer script/s @
Saturday	15-01-2022	10 A.M.	PHSA	CC5	MATHEMATICAL PHYSICS - II	1	
Sunday	16-01-2022	10 A.M.	PHSA	CC6	THERMAL PHYSICS	1	
Monday	17-01-2022	10 A.M.	PHSA	CC7	MODERN PHYSICS	1	
Tuesday	18-01-2022	10 A.M.	PHSA	SEC-A1	SCIENTIFIC WRITING	1	
Saturday	22-01-2022	10 A.M.	CEMG	GE3	PAPER 3	1	

Signature of the Principal/TIC/OIC of the College with Seal

Controller of Examinations (Actg.)

** Subject to unavoidable changes

++ In no circumstances subject/s to be altered

N.B. Please follow University Notification No. CE/ADM/18/229 Dated 04/12/2018 in www.cuexam.net for instruction of Examinee/Invigilator/Examination centre.

Authenticated.

Principal

Gokhale Memorial Girls' College

Determination of Temperature Coefficient of Resistance using Carey Foster Bridge

Sohini Mitra

BSc.(Hons.) Semester III Practical Examination,(Calcutta University), 2021

CU Registration No.:- 013-1211-0226-20

CU Roll No. :- 203013-11-0055

Physics (PHSA)

SEC- A1 (Scientific Writing)(Project)

Date:-31/1/22

1 THEORY

(i) At first, to find the resistance per unit length (ρ) of the bridge, wire connections are made as shown in Figure.1a where connections are made with the resistance box X in the extreme left gap G_1, a copper strip Y of practically zero resistance in the extreme right gap G_4 and two equal resistances Q_1 and Q_2 in the two middle gaps. Let with certain resistance X in the resistance box X the null point be obtained at a distance l_1 from the left end. When the box X with resistance X and the copper strip Y are interchanged, let the null point be obtained at a distance l_2 from the left end.

If λ_1 Ω and λ_2 Ω are the end resistances at the left and right ends of the bridge wire then before interchanging X and Y we may write by employing *Wheatstone bridge principle,*

$$\frac{Q_1}{Q_2} = \frac{X + \lambda_1 + l_1\rho}{Y + \lambda_2 + (100 - l_1)\rho}$$

$$\text{or,} \quad \frac{Q_1}{Q_1 + Q_2} = \frac{X + \lambda_1 + l_1\rho}{X + Y + \lambda_1 + \lambda_2 + 100\rho}$$

After interchanging X and Y, if we proceed in the same manner as indicated above we again get,

$$\frac{Q_1}{Q_1 + Q_2} = \frac{Y + \lambda_1 + l_2\rho}{X + Y + \lambda_1 + \lambda_2 + 100\rho}$$

From the above two values of the ratio $Q_1/(Q_1 + Q_2)$ we get,

$$X + \lambda_1 + l_1\rho = Y + \lambda_1 + l_2\rho$$

Then it can be shown that

$$\rho = \frac{X - Y}{l_2 - l_1}$$

As the resistance Y of the copper strip is practically zero, therefore,

$$\rho = \frac{X}{l_2 - l_1} \tag{1}$$

(ii) Now, the connections are made as in Figure.1b by placing the given wire of resistance R in the extreme right gap G_4, a resistance box S in the extreme left gap G_1 and two equal resistances Q_1 and Q_2 in the two middle gaps G_2 and G_3 respectively. Let a null point be obtained at a distance l_1' from the left end with a resistance S in the resistance box S. On interchanging the positions of the given wire R and the resistance box S, a new null point is obtained at a distance l_2' from the left end.

Then it can be shown that

$$\rho = \frac{S - R}{l_2' - l_1'}$$

$$\text{or,} \quad R = S - \rho(l_2' - l_1') \tag{2}$$

(iii) If the resistances R_1 and R_2 of the given wire at two different temperatures $t_1°C$ (low) and $t_2°C$ (high) are found out by using equation 1 and equation 2, then it can be shown that the temperature-coefficient (α) is given by

$$\alpha = \frac{R_2 - R_1}{R_1 t_2 - R_2 t_1} \text{ per } °C \tag{3}$$

LATEX SOURCE CODE

```
\documentclass[12pt]{article}
\usepackage[UTF8]{inputenc}
\usepackage{amsmath}
\usepackage{amssymb}
\usepackage{mathtools}
\usepackage{graphicx}
\usepackage{txfonts}
\usepackage{amsfonts}
\usepackage[T1]{fontenc}
\usepackage{mathdesign}
\usepackage{caption}
\usepackage{subcaption}
\usepackage{titling}
\usepackage{enumitem}
\usepackage{bm}
\usepackage{makecell}
\usepackage{geometry}
\usepackage{setspace}
\geometry{a4paper,margin=1.0in}
\graphicspath{E:\Latex practice files}
\def\nn{\nonumber}
\def\no{\noindent}
```

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"Focus like a laser not a flashlight"

Michael Jordan

January 30, 2022

SEC-A (PROJECT)

- University Registration Number - 013-1211-0234-20
- University Roll Number - 203013-11-0060
- College Roll Number - 20/BSCH/0131

INTRODUCTION

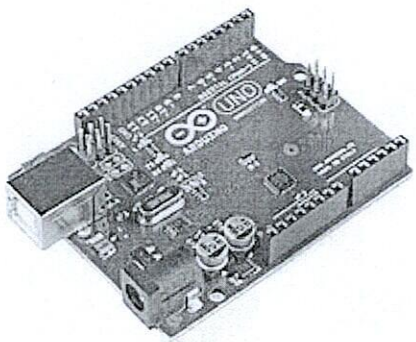
What is Arduino?

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Its hardware products are licensed under a CC-BY-SA license, while software is licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL),[1] permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially from the official website or through authorized distributors.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs. The microcontrollers can be programmed using the C and C++ programming languages, using a standard API which is also known as the "Arduino language". In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) and a command line tool (arduino-cli) developed in Go.

Arduino Uno

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.[2][3] The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.[4] It can be powered by the



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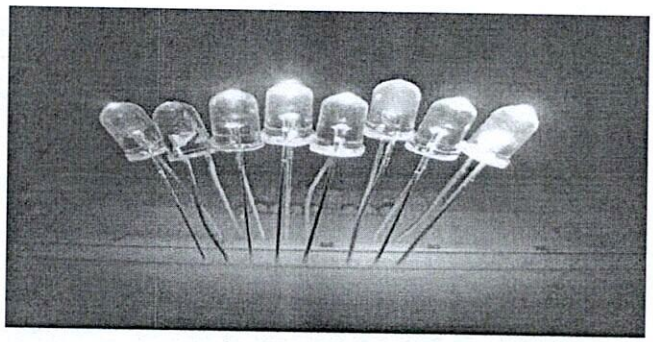
PROJECT 1:

LED Blinking and Fading

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. LEDs are small, powerful lights that are used in many different applications.



• LED Blinking

Here, we will work on blinking an LED, the Hello World of microcontrollers. It is as simple as turning a light on and off.

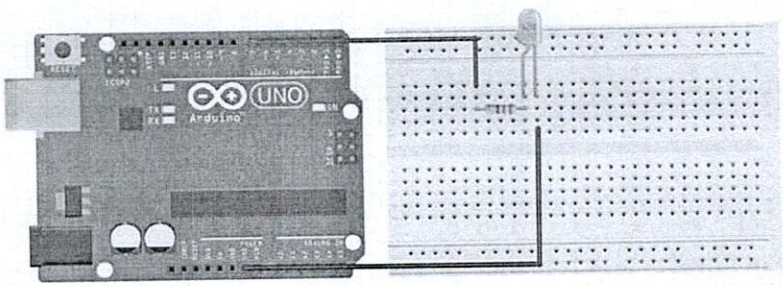
Components Required

- 1 × Breadboard
- 1 × Arduino UNO R3 board
- 1 × LED
- 1 × 330Ω Resistor
- 2 × Jumper wires

The Circuit

First, we connect pin 7 on our Arduino to a spot on our breadboard, then the resistor. On the other side of the resistor, we insert our LED.

Note: LEDs are polarized, meaning that they have a certain way they need to be connected if we are to not blow them. We connect the positive lead of the LED to the resistor and run a wire from the ground lead to the GND pin on the Arduino. The result will look like this schematic below.



The Code

```
int led = 7;
void setup(){
  pinMode(led,OUTPUT);
}
void loop(){
  digitalWrite(led,HIGH);
  delay(1000);
  digitalWrite(led,LOW);
```

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