SJC INSTITUTE OF TECHNOLOGY

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|| Jai Sri Gurudev ||

Sri Adichunchanagiri Shikshana Trust ®

Estd : 1986

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

AICTE Approved, Accredited by NAAC with A+ Grade & NBA (CSE, ISE, ECE, ME, CV & AE), Gold Rated by QS I-Gauge

P.B. No.20, B.B Road, Chikkaballapur - 562 101, Karnataka

Estd : 1986

38 years of Excellence in Quality Education

INTEGRATED PHYSICS LAB MANUAL

FOR CS / EC STREAM

Name :...

Branch :.. Sem. :.....................

USN :..

Subejct :...

Our Primary Focus is on Education, Empowerment & Environment

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SJCIT
Chickballapur

VISION

Preparing Competent Engineering and Management Professionals to Serve the Society

MISSION

- Providing Students with a Sound Knowledge in Fundamentals of their branch of Study.
- Promoting Excellence in Teaching, Training, Research and Consultancy.
- Exposing Students to Emerging Frontiers in various domains enabling Continuous Learning.
- Developing Entrepreneurial acumen to venture into Innovative areas
- Imparting Value based Professional Education with a sense of Social Responsibility.

Semester I/II

CIE for the practical component of the Integrated Course

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- The15 marks are for conducting the experiment and preparation of the laboratory record, the other 05 marks shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks.
- Marks of all experiments' write-ups are added and scaled down to 15 marks. The laboratory test (duration 02/03 hours) at the end of the 14th /15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 20 marks.

Passing standard:

Minimum 08 (40% of maximum marks -20) marks in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.

Laboratory Component:

The experiments have to be classified into

a) Exercise
b) Demonstration
c) Structured Inquiry
d) Open Ended

General Instructions

- Before entering the lab the student should carry the following things.
  1. Identity card issued by the college.
  2. Class notes
  3. Lab observation book
  4. Lab Manual
  5. Lab Record
  6. Scientific calculator
- Students have to attend all the labs regularly in time. If there is any genuine reason for absent then, with the permission of Lab in charge & HOD they have to complete the corresponding experiment within next lab.
- Students should come prepared for the lab by reading the procedure of the respective experiment thoroughly and reading the viva questions and answers for the corresponding experiment.
- In case of electrical experiment, before switching ON the circuit, show the circuit connections to the lab in-charge.
- While leaving the experimental table, switch off the devices.
- Before finishing the experiment, show and get signature on at least one reading from the lab in-charge.
- Don't use pencils for entering readings in the tabular column. Use only pen to write the readings and don't overwrite the readings.
- Plan the experimental work so that it is finished within the stipulated time.
- On the same day of performing an experiment, the concerned teacher-in-charge must sign the calculations and for that experiment, the internal assessment marks should be obtained. Failing this, one will get zero marks for that experiment.
- Lab record must be completed, before coming to the next Lab session. Record writing also carries marks.
- The lab internal assessment marks will be given by considering the following things, Average marks obtained for each experiment, lab internal marks (conducted at the end of the semester) and based on the attendance percentage.
- The minimum marks to be obtained in the lab internal assessment is 25.
- If any student fails to get minimum marks, that student is marked as NSSR (Not Satisfied Sessional Requirement) and will be detained in the lab.
- The detained student has to take the lab exam once again in the next semester and he has to attend the lab regularly and get internal marks.

INDEX

SL.NO	Name Of The Experiment	Page No.	Date Of Conduction
1	Wavelength of LASER using Grating	6	
2	Numerical Aperture using optical fiber	12	
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4	Charging and Discharging of a Capacitor	22	
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8	Plank's Constant using LEDs	46	
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10	Application of statistics using spread sheets	57	
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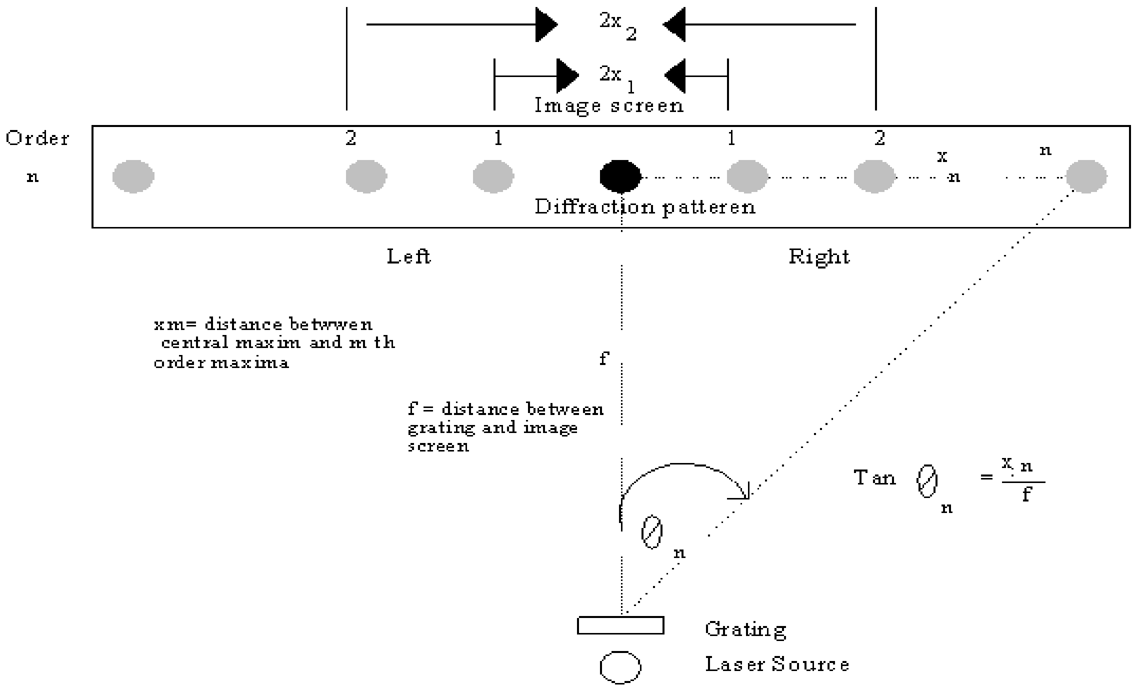

OBSERVATION:

Grating constant $d = \frac{1}{N} = \frac{1}{\text{no.of lines per inch}}$

$$d = \frac{1}{N} = \frac{2.54\,\text{cm}}{\text{no.of lines on grating}} = ------- = ----------- m$$

TABULAR COLUMN:

500 LPI grating, f=100cm				
Diffraction Order = n	**Distance**		**Diffraction angle (θ_n)°**	**λ (nm)**
	$2x_n$(cm)	**x_n(cm)**		
1				
2				
3				
4				
5				

Average λ = ------------nm

EXPERIMENT NUMBER: 01

WAVELENGTH OF LASER USING GRATING

AIM: To determine the wave length of LASERS by using diffraction grating.

APPARATUS: LASER source, Grating, Grating holder, meter scale, Screen.

FORMULA: The n^{th} order diffraction angle is given by

$$\theta_n = \tan^{-1}\frac{x_n}{f} \quad \text{in degree ---(1)}$$

The wavelength of laser light is given by

$$\lambda = \frac{d\sin\theta}{n} \quad \text{in nm---- (2)}$$

Where, x_n is the distance of n^{th} order diffraction pattern from the centre 0^{th} order diffraction

f is the distance between the screen and the grating

d is grating constant

θ is the angle of diffraction

n = 1, 2, 3… m is called order of diffraction

PRINCIPLE:

A laser consists of single wavelength falling on a grating will produce diffraction pattern. The principal maximum intensity of the diffracted light is given by $d\sin\theta = n\lambda$. In this equation all the terms are constant except θ. The angle θ can be measured by experiment by measuring accurately the distance between source and image and distance between the consecutive maximums. Different order of diffraction is the result of different incident angle θ. Hence to specify order θ has been rewritten as θ_n, which indicate the diffraction angle for n^{th} order. Indicates process of diffraction, using laser light and grating. The n^{th} order diffraction angle is given by $\theta_n = \tan^{-1}(\frac{x_n}{f}$ Where, x_n is the distance of n^{th} order diffraction pattern from the centre 0^{th} order diffraction, f is the distance between the screen and the grating. Substituting θ_n in Eaquation-1, Wave length can be calculated by using equation $\lambda = \frac{d\sin\theta\, n}{n}$

PROCEDURE:

The laser is placed on a study table and switched on. At about two meters away on the path of the laser a white laminated wooden screen is placed. The exact distance between the grating stand and image screen are noted f = 1.0m = 100cm.The grating is now placed on the grating

stand close to the laser source and the diffraction pattern is observed as shown in the Figure. Equally spaced diffracted laser light spots are observed. The total numbers of spots are counted. The central direct ray is very bright in the picture as the order increased the brightness deceased. The centre of the spots of the diffraction pattern are marked on the screen using a pencil and after marking all the diffraction pattern, the image screen is removed and the distances between consecutive order of diffraction is measured using a scale and tabulated The distance between the two first ,second, third….etc. orders diffraction spots are measured. Using equation-2 diffraction angles are calculated .Similar calculations are made for different orders of the diffraction and the diffraction angle is calculated. Similar calculations are done for different orders of the diffraction and the grating constant obtained is tabulated in Table-1. And the average value of wavelength of laser source is calculated.

RESULTS: The wavelength of LASER light is found to be ------------nm

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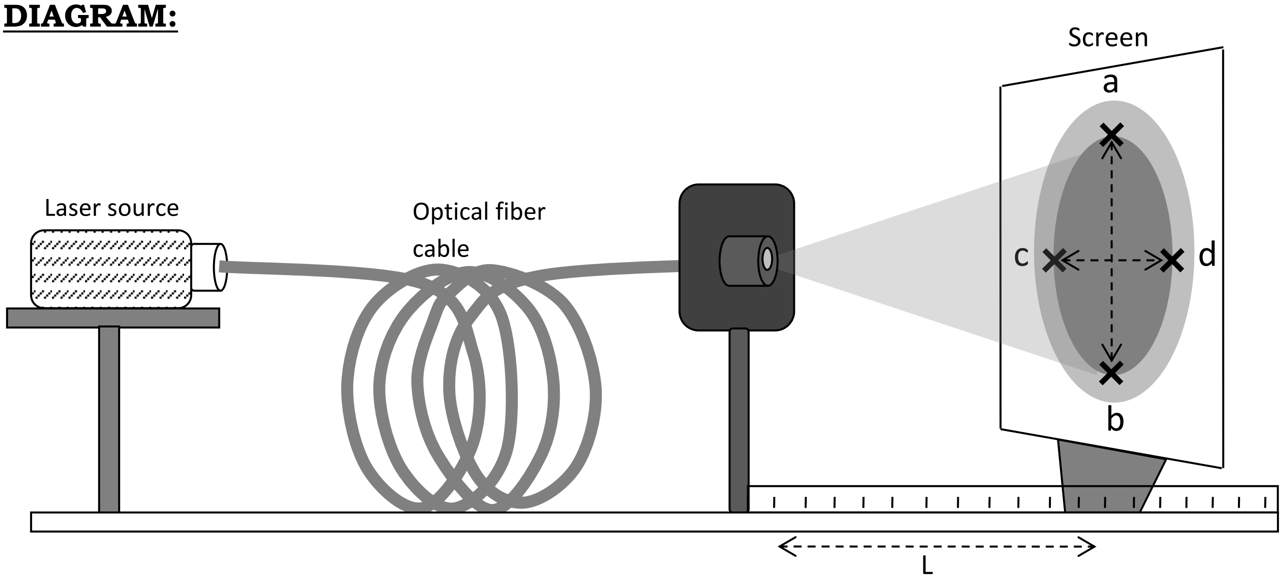
Rubrics for Continuous Evaluation -2022 scheme (15M)

Particulars	Allotted Marks	Marks obtained
Experimental Write up	**03**	
Conduction of experiment observation, Calculation , Result	**05**	
Viva-Voice	**02**	
Record write-up	**05**	
Total	**15**	

Signature of batch in- charge / Co faculty

DIAGRAM:



Tabular column:

Trail No.	L (in cm)	Horizontal diameter D_1 (in cm)	Vertical diameter D_2 (in cm)	Mean Diameter D (in cm)	Acceptance angle $\theta_0 = \tan^{-1}\left(\frac{D}{2L}\right)$	Numerical aperture NA $NA = \sin\theta_0$
1						
2						
3						
4						

$(\theta_0)_{mean} =$ ____________ $(NA)_{mean} =$ ___________

EXPERIMENT NUMBER: 02

NUMERICAL APERTURE USING OPTICAL FIBER

AIM: To determine the Acceptance angle and Numerical aperture of the given optical fiber.

APPARATUS: Laser source, Optical fiber, Screen, Scale.

FORMULA: The Acceptance angle,

1. $$\theta_0 = \tan^{-1}\left(\frac{D}{2L}\right)$$

Where,

D – the diameter of the bright circle formed on screen,

L – the distance between the optical fibre end and screen.

2. Numerical Aperture, $NA = \sin\theta_0$

Where,

θ_0 is acceptance angle in degree

PROCEDURE:

Switch on the laser source and adjust the distance between output end of the optical fiber and the screen 'L' (say 5 cm). Place a graph sheet on the screen and observe the circle formed on the graph sheet. Mark the points 'a','b','c' & 'd' on the inner bright circle as shown in the diagram. Note down the horizontal diameter D_1 and vertical diameter D_2 of the inner bright circle in the tabular column. Repeat the above steps for different values of L (for 4cm, 3cm,). Find the Acceptance angle from the tabular column and hence the Numerical aperture.

RESULT: The Angle of acceptance and Numerical aperture of the given optical fiber are found to be θ_0 = ……… NA = …………

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Rubrics for Continuous Evaluation -2022 scheme (15M)

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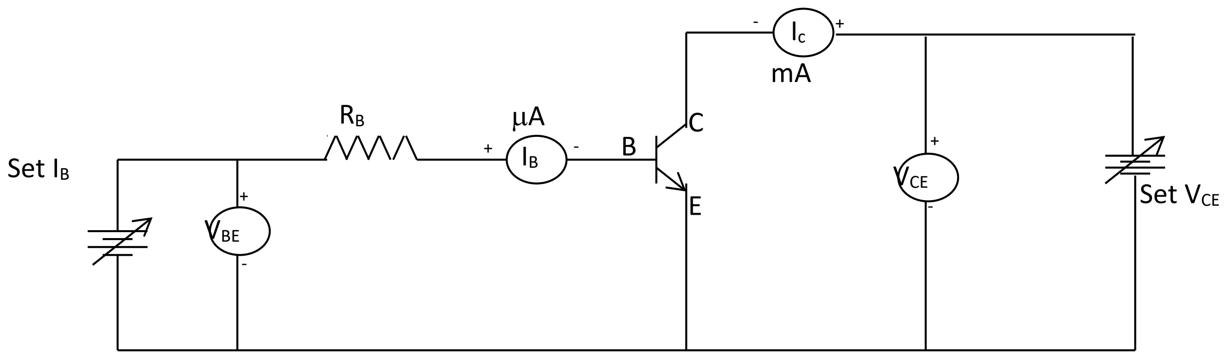
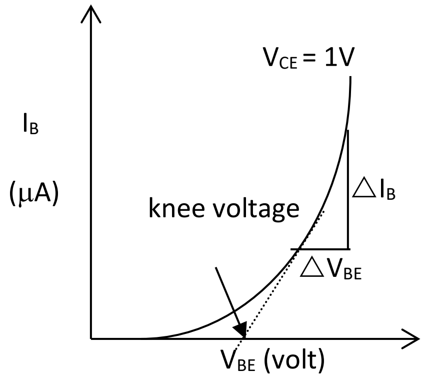
Viva-Voice	**02**	
Record write-up	**05**	
Total	**15**	

Signature of batch in- charge / Co faculty

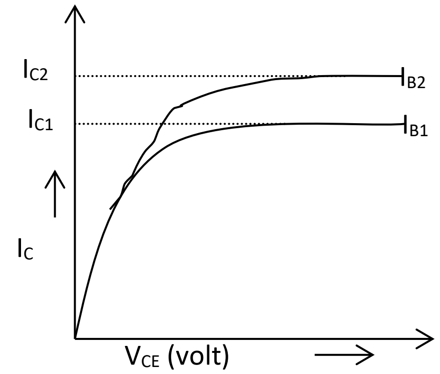
CIRCUIT DIAGRAM and SPECIMEN GRAPH NATURE:



Input characteristics



Output characteristics



TABULAR COLUMN:

1. Input characteristics:

V_{CE} = ……… V

V_{BE} (volt)	I_B (µA)

EXPERIMENT NUMBER: 03

TRANSISTOR CHARACTERISTICS

AIM: To study the input and output characteristics of the given NPN transistor in the common emitter configuration and to determine its input resistance, DC current gain and current amplification factor.

APPARATUS : Transistor characteristics kit consisting of power supply, digital voltmeter, digital milli ammeter and digital micro ammeter.

FORMULA : 1. $\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{I_{C2} - I_{C1}}{I_{B2} - I_{B1}}$

Where ΔI_B =change in base current

ΔI_C = corresponding change in collector current

2. $R_i = \frac{\Delta V_{BE}}{\Delta I_B}$.

ΔV_{BE}=change in voltage across base and emitter.

ΔI_B =change in base current

3. Current amplification factor $\alpha = \frac{\beta}{1+\beta}$

PROCEDURE:

The circuit connections are made as shown in the figure.

i) To study the input characteristics:

The digital voltmeter is connected across the C-E junction. The voltage V_{CE} is adjusted to 1 V. Now the voltmeter is disconnected and connected across the base emitter junction. V_{BE} is varied in the steps of 0.1 V and the corresponding current I_B is recorded. A graph is plotted with I_B along Y-axis and V_{BE} along X-axis. From the graph the input resistance can be calculated using the formula

Knee voltage, V_{knee} = ……… V ΔV_{BE} =--------V

ΔI_B =----------μA

Input resistance, $R_i = \frac{\Delta V_{BE}}{\Delta I_B}$

=

= ……. Ω.

A graph Output characteristics:

I_{B1} = 20 μA		I_{B2} = 40 μA	
V_{CE} (volt)	I_C (mA)	V_{CE} (volt)	I_C (mA)
0.1		0.1	
0.2		0.2	
0.3		0.3	
0.4		0.4	
0.5		0.5	
0.6		0.6	
0.7		0.7	
0.8		0.8	
0.9		0.9	
1.0		1.0	

$R_i = \frac{\Delta V_{BE}}{\Delta I_B}$.

The knee voltage (cut-in voltage) i.e., the voltage beyond which current I_B increases rapidly with increase in V_{BE} is evaluated by extrapolating the steep portion of the curve.

ii) To study the output characteristics:

The digital voltmeter is connected across collector-emitter junction. The base current I_B is adjusted to a suitable value. V_{CE} is varied in small steps (0.1V) and in each case the collector current I_C is noted. The procedure is repeated for different I_B. Graph is plotted with V_{CE} along X-axis and I_C along Y-axis. The current gain 'β' and output resistance is found out from the graph using the formulas,

$$\beta = \frac{\Delta I_C}{\Delta I_B} \qquad R_o = \frac{\Delta V_{CE}}{\Delta I_c}.$$

RESULT:

1. Input resistance, R_i = ... Ω
2. Current gain, β = ...
3. Current amplification factor α = ----------------

CACULATIONS:

$$\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{I_{C2} - I_{C1}}{I_{B2} - I_{B1}} =$$

$$\alpha = \frac{\beta}{1+\beta} =$$

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Rubrics for Continuous Evaluation -2022 scheme (15M)

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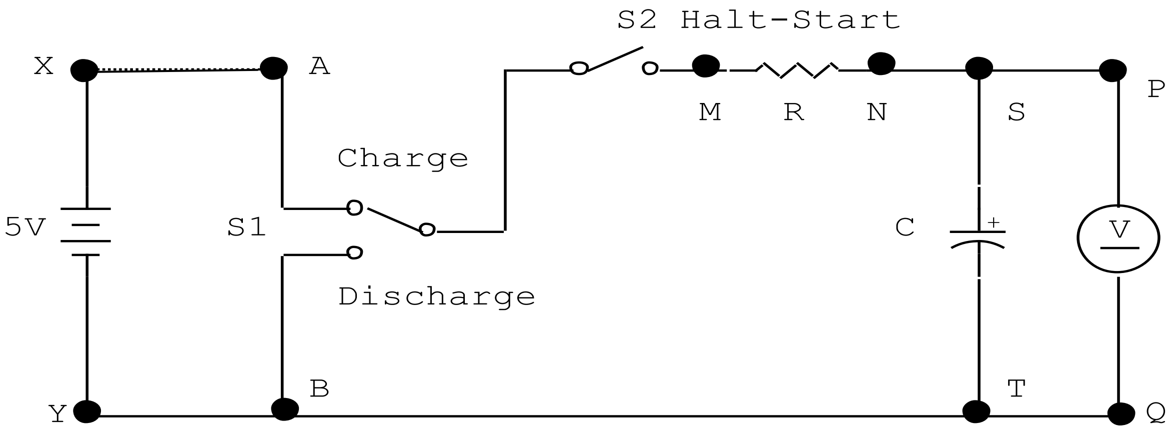
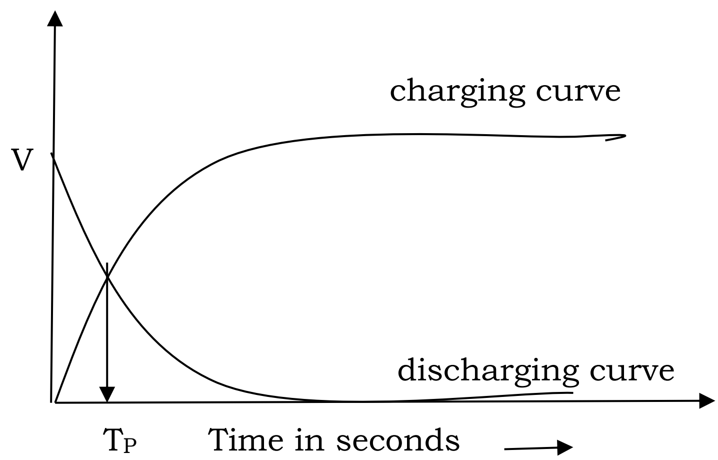
Viva-Voice	**02**	
Record write-up	**05**	
Total	**15**	

Signature of batch in- charge / Co faculty

CIRCUIT DIAGRAM:



SPECIMAN GRAPH NATURE:



OBSERVATIONS:

Physical dimensions of capacitor

Capacitor	C1	C2	C3
Length(mm)	47	114	183
Breadth (mm)	5	5	6
Separation (mm)	0.075	0.075	0.075

EXPERIMENT NUMBER: 04

CHARGING AND DISCHARGING OF A CAPACITOR

AIM: To determine the dielectric constant of unknown dimensions of a capacitor by charging and discharging it through a resistor.

APPARATUS: Stop clock (0.1 sec resolution), Digital DC voltmeter, set of resistors, set of capacitors, DC power supply etc.

FORMULA : The capacitance of the parallel plate capacitor is given by

$$C = \frac{Tp}{0.693R} \text{ in Farad}$$

Where, Tp is half time in seconds.

R is the resistance in Ω

The dielectric constant of the material is given by

$$\varepsilon_r = \frac{Cd \, x \, 10^{-6}}{A\varepsilon_0}$$

Where,

ε_0 is the permittivity of free space = 8.854×10^{-12} Fm^{-1}.

A is the area of the plate.

d is the distance(separation) between the plates or thickness of the dielectric material.

PROCEDURE:

The circuit connections are made as shown in circuit diagram. R selected as 100KΩ and Capacitor C1 is selected and connected to the circuit using patch cords. The digital stop clock is reset by pressing reset button. The display indicates 00.0. The digital DC voltmeter and 5V-power supplies are connected to the circuit as shown in Figure-1. Switch S1 (Charge-discharge) is thrown to the charge position. Switch S2 (Halt-Start) is thrown to the start

TABULAR COLUMN:

C = C_1, **R_1 = K Ω**

Time (sec)	voltage in volts	
	Charging voltage(V)	Discharge voltage(V)
0		
5		
10		
15		
20		
25		
30		
35		
40		
45		
50		
55		
60		
70		

CALCULATION:

1. The capacitance of the parallel plate capacitor is given by

$$C = \frac{Tp}{0.693R} \text{ in Farad}$$

2. The dielectric constant of the material is given by

$$\varepsilon_r = \frac{Cd \; x \; 10^{-6}}{A\varepsilon_0}$$

position watching the digital stop clock and the voltmeter. The clock is stopped by controlling Halt-Start switch after 5 seconds and the voltmeter reading is noted. The capacitor is charged for 5 seconds and voltage across the capacitor after 5 second is noted.

When the capacitor is charged to maximum voltage (4.5V and above), the charging is stopped and the charge discharge switch is thrown to discharge position and clock is reset. The voltage across the discharging capacitor is noted after 5 seconds interval by stopping clock after five seconds. This is done until the capacitor is discharged fully. Similarly Experiment is repeated for C_2 and C_3 capacitors with resistance values R_2 and R_3.

RESULT: Dielectric constant of the materials is found to be ε_r =------------

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Rubrics for Continuous Evaluation -2022 scheme (15M)

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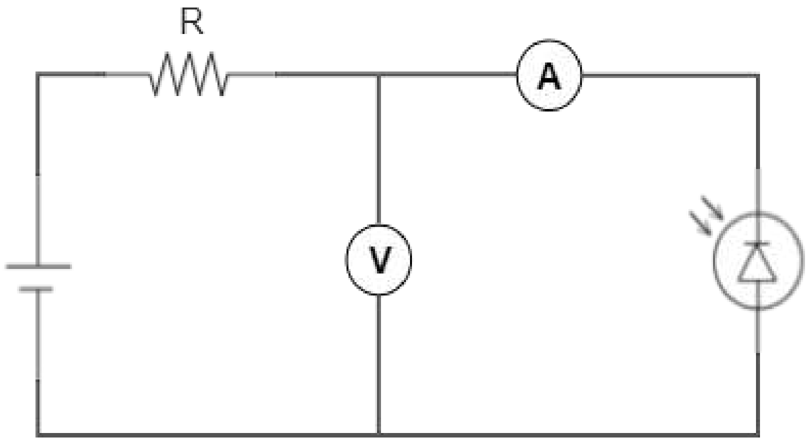
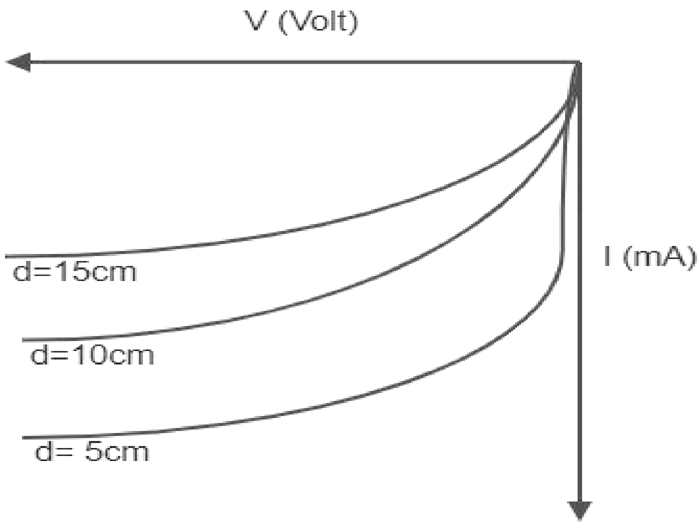
Conduction of experiment observation, Calculation , Result	**05**	
Viva-Voice	**02**	
Record write-up	**05**	
Total	**15**	

Signature of batch in- charge / Co faculty

CIRCUIT DIAGRAM:



SPECIMEN GRAPH NATURE:



EXPERIMENT NUMBER: 05

PHOTO DIODE CHARACTERISTICS

AIM: To study the I-V characteristics of a photo diode.

APPARATUS:

Photodiode experimental setup consisting of: 0-3V regulated power supply, 0-2mA digital dc current meter, 0-20V digital dc volt meter,white light LED module, and photo diode LED type.

PRINCIPLE:

Silicon diodes do not conduct in the reverse bias whereas the Photo Diodes are optimized to conduct in the reverse bias by controlling the level of doping and also due to its inherent structure. When there is no light falling on the Photo Diode it does not conduct in the reverse bias, hence light is must for electrical conduction in Photo Diode.

An increase in illumination results in the number of electron hole pairs generated in the semiconductors and the minority charge carries which are generated close to the junction are swept across the junction in this way constitute flow of photoelectric current through the diode.When illuminated, the diode current under reverse baised condition becomes leakage current and photoelectric current. The I-V characteristics are shown in the fig.2

PROCEDURE:

The circuit connections are made shown in the fig.1. The voltage is varied in intervals of 1volt (0-10) and corresponding values of diode current is noted down in milli ammeter. (Adjust the distance between light source and photodiode such that ammeter current does not exceed 2 to 2.5 m A). Plot a graph of voltage applied versus diode current. Change the light intensity with the help of control knob. Again take readings of applied voltage and corresponding diode current & plot on the same graph. The graph will be similar to the one shown in figure.

TABULAR COLUMN:

SL.NO.	Voltage(Volts)	Current I(mA)		
		d=5cm	d=10cm	d=15cm
1				
2				
3				
4				
5				
6				
7				
8				

RESULT: The I-V characteristics of a photo diode are studied and the readings are

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Rubrics for Continuous Evaluation -2022 scheme (15M)

Particulars	Allotted Marks	Marks obtained
Experimental Write up	**03**	
Conduction of experiment observation, Calculation , Result	**05**	
Viva-Voice	**02**	
Record write-up	**05**	
Total	**15**	

Signature of batch in- charge / Co faculty

CIRCUIT DIAGRAM:

SERIES RESONANCE: **PARALLEL RESONANCE:**

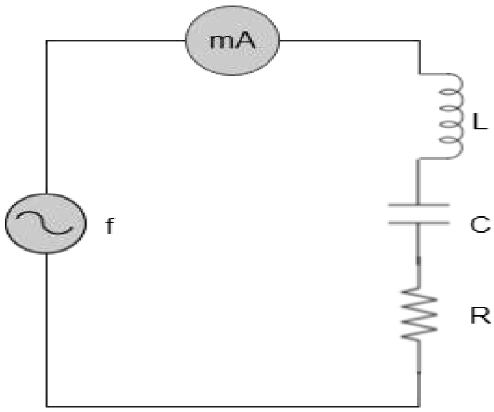

Fig.1

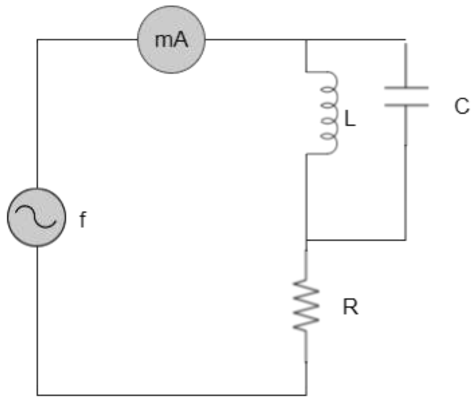

Fig.2

SPECIMEN GRAPH: **SPECIMEN**
GRAPH:

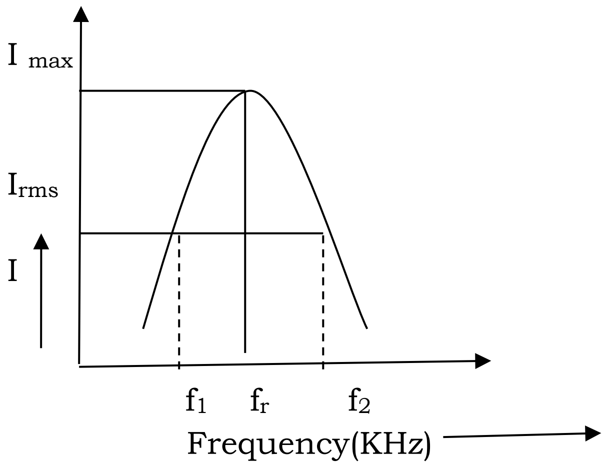

Fig.3 Plot of Current v/s frequency for Series LCR Circuit

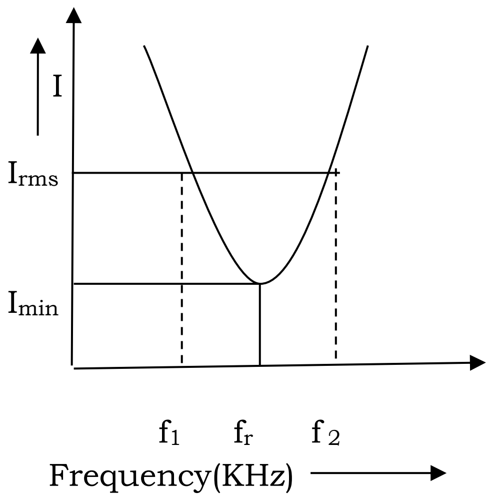

Fig.4 Plot of Current v/s frequency for Parallel LCR Circuit

$I_{rms} = \frac{I_{max}}{}$

I_{min} $\sqrt{2}$ √2

$I_{rms} =$

EXPERIMENT NUMBER: 06

SERISE AND PARALLEL LCR

AIM: To study the frequency response of the series and parallel resonance circuits and To determine the included value of the given inductor, bandwidth and quality factor of the circuits.

APPARATUS: Audio frequency oscillator, AC multi meter, inductance of unknown value, resistor and capacitor of known value.

FORMULA:

1. The inductance $L = \frac{1}{4\pi^2 f_r^2 C}$ Henry.

   Where f_r is the resonant frequency

   C is the capacitance of a capacitor

2. The quality factor $Qf = \frac{fr}{BW}$

3. The bandwidth $BW = f_2 - f_1$ KHz

PROCEDURE:

1. **SERIES RESONANCE:**

The resistor, capacitor, inductor are connected in series with signal generator as shown in the fig.1. Set the amplitude of the signal generator for maximum and multimeter for 200 volts AC range. The frequency is increased in steps of 1 KHz (1000Hz) and corresponding value of current is recorded in ammeter. Until the current is reaches maximum and further decreases to minimum.

The resonance graph is plotted by taking frequency f (in K*Hz*) along X-axis and current ***I*** *(*in *mA)* along Y-axis. The frequency f_r corresponding to I_{max} is marked on the graph. A straight line is drawn parallel to X-axis at the point $I_{\max}/\sqrt{2}$, which cuts resonance curve at the frequencies $\boldsymbol{f_1}$ and $\boldsymbol{f_2}$. The bandwidth is given by $BW = f_2 - f_1$ K*Hz.*

2. **PARALLEL RESONANCE :**

The capacitor is connected in parallel with the inductor. The combination is connected in series with the resistor and signal generator as shown in the fig.2. The experiment is repeated as in the case of series, here the current decreases, becomes minimum and again increases as frequency is increased.

OBSERVATIONS AND TABULAR COLUMN:

SERIES RESONANCE

Resistance R = … Ω.   Capacitance C = ……. μF.

Frequency *KHz*	Current(mA)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

PARALLEL RESONANCE

Resistance R = … Ω.   Capacitance C = ……. μF.

Frequency *KHz*	Current(mA)
1	
2	
3	
4	
5	
6	
7	
8	
9	

The resonance graph is plotted by taking frequency *f* (in K*Hz*) along X-axis and current *I* (in *mA)* along Y-axis. The frequency f_r corresponding to I_{min} is marked on the graph. A straight line is drawn parallel to X-axis at the point Imin√2, which cuts resonance curve at the frequencies f_1 and f_2. The bandwidth is given by

RESULT:

1. The value of the inductance of the given inductor is found to be ***L*** = …….**H**

2. The quality factor is found to be
   i) for series resonance ***Q*** = ……….
   ii) for parallel resonance ***Q*** = ……….
3. The band width i) for series resonance BW = …… K***Hz***
   ii) for parallel resonance BW = ……. .K***Hz***

CALCULATIONS:

Series resonance:

The value of inductance $L = \frac{1}{4\pi^2 f_r^2 C}$ H

The quality factor of the circuit is $Qf = \frac{fr}{BW}$

The bandwidth $BW = f_2 - f_1$ K Hz

Parallel resonance:

The quality factor of the circuit is $Qf = \frac{fr}{BW}$

The bandwidth BW $= f_2 - f_1$ KHz

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Rubrics for Continuous Evaluation -2022 scheme (15M)

Particulars	Allotted Marks	Marks obtained
Experimental Write up	**03**	
Conduction of experiment observation, Calculation , Result	**05**	
Viva-Voice	**02**	
Record write-up	**05**	
Total	**15**	

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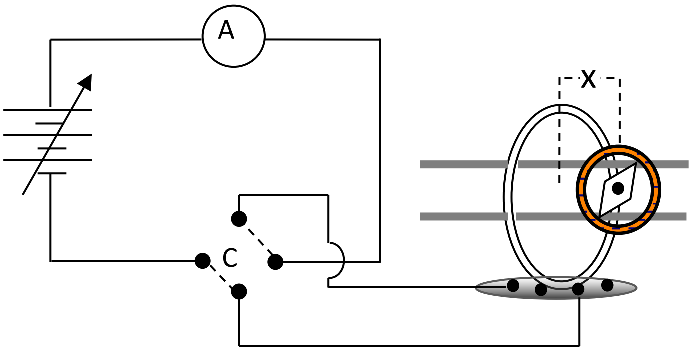
CIRCUIT DIAGRAM:



TABULOR COLUMN: **n = 50 turns**

Sl. No.	Current I in A	X in cm	Deflections in degrees				Average θ in degree	B inT	$B_H = \frac{B}{\tan\theta}$ In T
			θ_1	θ_2	θ_3	θ_4			
1	0.2	0							
2		5							
3		10							
4		15							
5	0.3	0							
6		5							
7		10							
8		15							

EXPERIMENT NUMBER: 07

MAGNETIC FIELD AT ANY POINT ALONG THE AXIS OF A CIRCULAR COIL

AIM: To determine the magnetic field intensity along the axis of a circular coil carrying current and earth's horizontal magnetic field by deflection method.

APPARATUS: Deflection magnetometer, sprit level, commutator, ammeter, variable power supply and connecting wires.

FORMULA:

$$B = \frac{\mu_0 n I}{2} \frac{a^2}{\left(a^2 + x^2\right)^{3/2}}$$

Where B – the magnetic field intensity at the centre of a circular coil,

n – number of turns in the TG coil,

a – radius of the coil

x – distance between the centre of the coil and pointer in the compass box in meter

μ_0 - permeability of free space = $4\pi x 10^{-7}$ Hm^{-1}.

I – the current through the coil

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

Where B_H – horizontal component of earth's magnetic field and

θ – mean deflection in TG.

PROCEDURE:

The connections are made as shown in the circuit diagram. Arrange the deflection of the magnetometer in the magnetic meridian of

the earth. Now align the plane of the coil with respect to 90°-90° line of the magnetometer. Keep the magnetometer exactly at the centre of the coil (for this case x = 0). Pass a current I (say 0.2A) to flow through the coil and the corresponding magnetometer deflections θ_1 and θ_2 are noted. The direction of the current is reversed by using the commutator C and the corresponding magnetometer deflections θ_3 and θ_4 are noted. Average deflection θ is calculated. Calculate the magnetic field at the centre of the coil by using the given formula $B = \frac{\mu_0 nI}{2} \frac{a^2}{\left(a^2 + x^2\right)^{3/2}}$ and also B_H .

Repeat the experiment for different values of x (say 5cm, 10cm, ...) by sliding the magnetometer along the axis. Find the average of both B and B_H.

RESULT: The magnetic field intensity along the axis of the given circular coil is calculated and is as shown in the tabular column.

At the center (x = 0) it is found to be B = …………T and

Earth's horizontal magnetic field intensity is found to be B_H =……………T

Rubrics for Continuous Evaluation -2022 scheme (15M)

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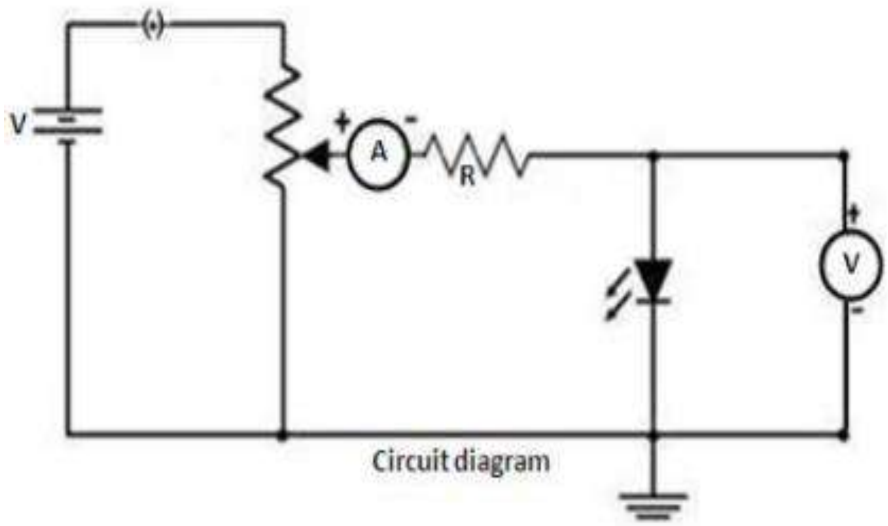
Tabular column

LED Color	Wavelength λ	Voltage V	Energy $E = eV$ in J	Frequency $\nu = c/\lambda$ in Hz	Planck's Constant h in JS^{-1}

Planck's Constant h=-----------------J/S^{-1}

Circuit Diagram



EXPERIMENT NUMBER: 08

PLANK'S CONSTANT USING LED'S

Aim: To determine the Planck's constant using Light Emitting Diode

Apparatus: 0-10 v power supply, one way key voltmeter, 1K ohm resistor and different known wavelength LED(light Emitting diodes)

Principle:

In 1900, German physicist Max Planck (1858-1947) was trying to model the broad smooth spectrum of electromagnetic radiation (i.e., light) emitted by a warm body. This "black body radiation" is what you see coming from the sun, the filament of an incandescent light bulb, or a hot electric stove element. Its 'spectrum', the range of frequencies making up the radiation, is readily displayed by a prism or a diffraction grating. In explaining the shape of the black body spectrum, Planck assumed that the electromagnetic radiation came not in continuous waves of energy, but in discrete clumps of energy which we now call photons. Planck postulated the 'photons', at each frequency have a discrete energy $E = h\nu$, where E is the energy of the photon in Joules, ν is the frequency in Hertz, and h is Planck's constant.

Formula:

$$E = hc/\lambda,$$

Where , $E = eV$ is the energy of the photon in Joules,

V is threshold voltage V (in Volts) across each LED.

ν is the frequency in Hertz, and

h is Planck's constant.

C is velocity of light $c = 3 \times 10^{8}$ m/s

Procedure:

The circuit connections are made as shown in the figure1. The red LED is connected across the voltmeter. The knee voltage of the red LED is noted down. The knee voltage for orange LED is obtained. The same is repeated for all other LED's. The results are tabulated.

The energy 'E' corresponding to the knee voltage 'V_0' is calculated, using the formula

$E = eV_0$

Where e is charge of the electron $=1.6x10^{-19}C$.

Using the given wavelength of the corresponding LED, the frequency 'ν 'of the emitted radiation is calculated using the formula,

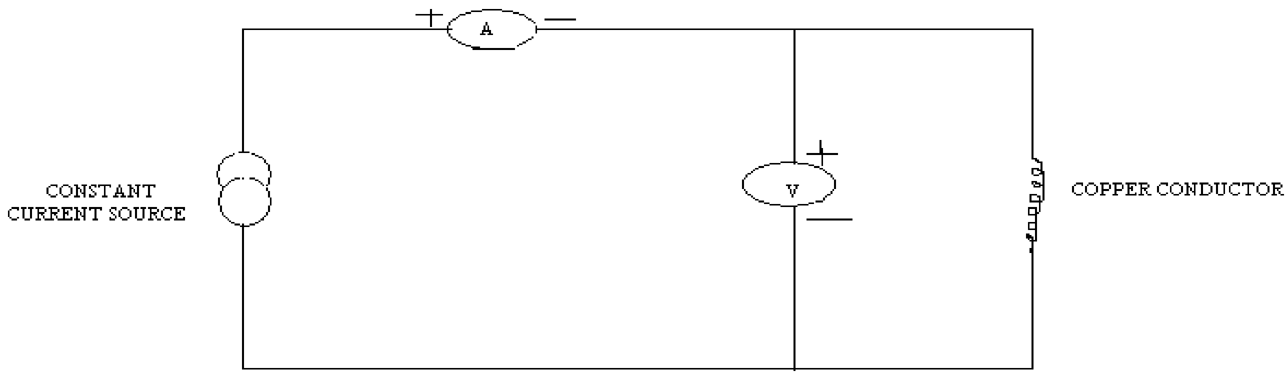
$\nu = c/\lambda$

Where c is the velocity of the light = $3x10^{8}$ m/s.

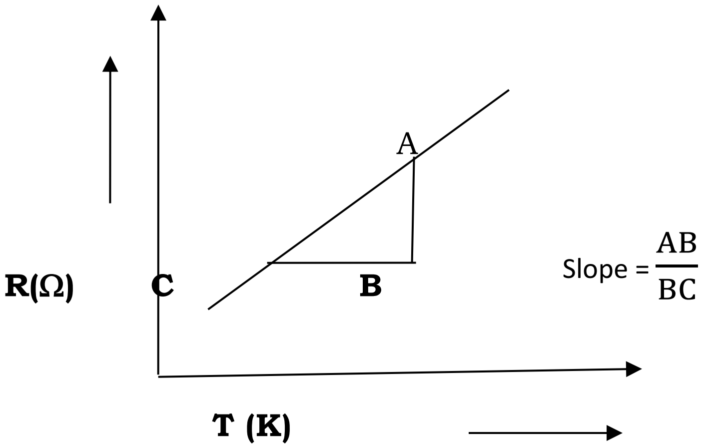
Result: Planck's constant h=----------------J/S

OBSERVATION:

CIRCUIT DIAGRAM:



SPECIMEN GRAPH:



TABULAR CALUMN:

Temperature		Voltage (mV)	Current (mA)	Resistance $R = \frac{V}{I}$ (Ω)
t (°C)	T (K)			
75				
70				
65				
60				
55				
50				
Room Temp.				

EXPERIMENT NUMBER: 09

FERMI ENERGY OF GIVEN CONDUCTOR

AIM: To determine the FERMI ENERGY and FERMI TEMPERATURE of the given conductor.

APPARATUS: Copper wire wounded on insulated material, laboratory thermometer, test tube beaker, Milli ammeter, Milli voltmeter and regulated power supply.

FORMULA: The Fermi energy of a given copper coil is calculated using the formula

1. $E_F = 1.37 \times 10^{-15} \sqrt{\frac{DAS}{L}}$ eV

Where, D id the density of the copper material

A is the area of cross-section of copper wire

L is the length of the copper wire in meter

S is the slope of the graph________

2. Fermi Temperature,

$$T_F = \frac{EF}{k} \quad K$$

Where k = 1.38×10^{-23} J K^{-1} is Boltzmann constant.

The Fermi energy of a given copper coil is calculated using the formula

$$E_F = 1.37 \times 10^{-15} \sqrt{\frac{DAS}{L}} \quad eV$$

Fermi Temperature,

$$T_F = \frac{EF}{k} \quad K$$

Where k = 1.38×10^{-23} J K^{-1} is Boltzmann constant.

DATE : ☐☐☐☐☐☐☐☐ Batch No............................

PRINCIPLE:

"The energy corresponding to the highest occupied level by the electrons in an energy band at absolute zero temperature is called the Fermi energy (E_F) and the energy level is referred to as the Fermi level. "Fermi level" is the term used to describe the top of the collection of electronic energy levels at absolute zero temperature.

"The Fermi temperature (T_F) is the temperature at which the thermal energy of the free electron in a solid becomes equal to the Fermi energy.

PROCEDURE: The circuit connections are made as shown in the figure 1. The given copper coil, which is connected across the milli voltmeter and thermometer are inserted into the test tube.

The test tube containing copper coil and thermo meter is immersed into the beaker containing boiling water. Starting from the 75^0C.The millivoltmetre reading and milli ammeter reading are recorded for every 5^0C fall of temperature. The readings are tabulated. Then the resistance of the coil at different temperatures T, is calculated using the formula R= $\frac{V}{I}$, Then a plot of resistance R versus Temperature T is made. Plot a graph of temperature T along X-axis and resistance R along Y-axis. The slope S is calculated from the graph as shown in the figure 2. Using the given length L and the radius of the copper wire r. The Fermi energy of a given copper coil is calculated using the formula.

Density of the copper wire D = 8930 Kg m^{-3}
Radius of the copper wire r = $0.26x10^{-3}$m
The Area of cross section of copper wire A = πr^2 = 2.1239 $X10^{-7}$ m^2
The Length of the copper wire L = 3.6 m,
S is the slope of the graph________

RESULT: 1. The Fermi energy of a given copper coil is found to be
E_F=------ eV

2. Fermi Temperature of copper T_F = -------- K

Rubrics for Continuous Evaluation -2022 scheme (15M)

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Viva-Voice	**02**	
Record write-up	**05**	
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EXPERIMENT NUMBER.10

Study of motion using spread sheets

Rubrics for Continuous Evaluation -2022 scheme (15M)

Particulars	**Allotted Marks**	**Marks obtained**
Experimental Write up	**03**	
Conduction of experiment observation, Calculation , Result	**05**	
Viva-Voice	**02**	
Record write-up	**05**	
Total	**15**	

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1. Wavelength of LASERS using grating

1. What is a plane diffraction grating?
   An optically plane glass plate on which very large no. of equally spaced opaque straight ruling is called diffraction grating.

2. What is a grating constant?
   It is the distance between two consecutive opaque rulings.

3. Explain the physical significance of grating constant?
   It is used to study the phenomenon of diffraction of light. When a ray of light is incident on the plate, it deviates from the mean path w r t its wavelength.

4. Explain the phenomenon of grating constant?
   It is one of the properties of light. When the light ray incident on opaque obstacle, it encroaches at the geometric shadow region. This property of bending of light is known as diffraction.

5. Where is the zero order spectrum?
   The central maximum is the zero order spectrum.

6. What is the LASER?
   Light Amplification by Stimulated Emission of Radiation. It is an optical device which amplifies the light. Laser requires an optical medium for amplification by achieving population inversion between a pair of energy levels.

7. What do you mean by population inversion and meta stable state?
   An artificial situation in which the number atoms in the excited state are greater than the number of ground state is called population inversion

8. How laser is more advantage than the ordinary source of light?
   Laser is monochromatic, high intense, high narrow beam of light.

9. What is mean by induced absorption?
   It is absorption of an incident photon by an atom as a result of which atom makes transition from ground state to an excited state such that the difference in energy of which two states is equal to energy of a photon.

10. What is mean by spontaneous emission?
    It is an emission of photo, when an atom transits excited state to lower energy states without aid of any external agency.

11. What is mean by stimulated emission?
The interaction of relevant energy with an excited atom triggers the excited atoms to drop to the lower energy state giving up a photon. The phenomenon of forced emission photon is called stimulated emission.

12. How do you distinguish between diffraction and refraction?
The property of bending of light is known as diffraction. Refraction is direction of light when it is passing through change in optical medium.

13. What is diffraction?
The deviation of light ray from its rectilinear path, when it passes across objects whose dimensions are comparable to the wavelength of incident light is called diffraction.

14. How many types of diffraction are there?
There are two types of diffraction.

a. Fresnel diffraction. And b. Fraunhofer diffraction

15. Distinguish between Fresnel diffraction and Fraunhofer diffraction?
In Fraunhofer diffraction the source and the screen are effectively at infinite distance from the diffraction slit or aperature. in Fresnel diffraction the source and the screen are both at finite distance.

16. What is the type of diffraction in the diffraction grating expt?
Fraunhofer diffraction is involved, because source and the screen are effectively at infinite distance.

17. Mention some of the applications of LASER?
Welding, cutting, &drilling

2. Numerical aperture using optical fiber

1. What is numerical aperture?
   Numerical aperture is thus considered as a light gathering capacity of an optical fibre. Numerical Aperture is defined as the Sine of half of the angle of fibre's light acceptance cone. i.e. NA= Sin θa where θa, is called acceptance cone angle.

2. What is acceptance angle?
   The acceptance angle of an optical fiber is defined: It is the maximum angle of a ray (against the fiber axis) hitting the fiber core which allows the incident light to be guided by the core.

3. How do you explain total internal reflection?

When light goes from a denser medium to a less dense medium, as the angle of incidence exceeds the critical angle, the ray reflects back to the denser medium. This phenomenon is called Total Internal Reflection. Total Internal Reflection is a very efficient reflection, as the loss of light energy is almost negligible. Example: such as glass to air or water to air.

4. Give some lively examples which use total internal reflection?
   Total internal reflection is the operating principle of optical fibers, which are used in endoscopes and telecommunications.

5. What is optical fibre?
   An optical fiber is a very thin strand of plastic or glass that is used to transmit messages via light.

6. Mention the types of optical fiber.
   Single mode fiber is optical fiber that is designed for the transmission of a single ray or mode of light as a carrier and is used for long-distance signal transmission. Multimode fiber is optical fiber that is designed to carry multiple light rays or modes concurrently, each at a slightly different reflection angle within the optical fiber core. Multimode fiber transmission is used for relatively short distances because the modes tend to disperse over longer lengths (this is called modal dispersion).

7. What are the applications of optical fiber?
   Internet: Fiber optic cables transmit large amounts of data at very high speeds. This technology is therefore widely used in internet cables. As compared to traditional copper wires, fiber optic cables are less bulky, lighter, more flexible and carry more data.
   Cable Television: The use of fiber optic cables in the transmission of cable signals has grown explosively over the years. These cables are ideal for transmitting signals for high definition televisions, because they have greater bandwidth and speed. Also, fiber optic cables are cheaper as compared to the same quantity of copper wire.
   Telephone: Calling telephones within or outside the country has never been so easy. With the use of fiber optic communication, you can connect faster and have clear conversations without any lag on either side.

2. What is attenuation?
   Attenuation or loss in optical fibers basically refers to the loss of power. During transit, light pulse loses some of their photons, thus reducing their amplitude. Attenuation for a fiber is usually specified in decibels per kilometer. The degree of attenuation depends on the wavelength of light transmitted. Attenuation measures the reduction in signal strength by comparing the output power with input power. Measurements are made in decibels (dB). The basic measurement for loss is done by taking the logarithmic ratio of input power (Pi) to the output power (Po).

3. What is bending loss and types of bending loss in optical fibers?
   Transmission loss in the fiber during its propagation through the optical fiber cable.
   Types of bending losses in optical fiber are
1. Addition of impurity to fiber.
2. Material composition loss.
3. Absorption & scattering loss.
4. Radiation loss

4. What are the advantages of optical fiber?
1. Greater bandwidth. 2. Low attenuation and greater distance 3. Security

5. What is step index and graded index fiber of an optical fiber?
   Step Index fiber : A step-index profile is a refractive index profile characterized by a uniform refractive index within the core and a sharp decrease in refractive index at the core cladding interface so that the cladding is of a lower refractive index. In fiber optics, a graded index is an optical fiber whose core has a refractive index that decreases with increasing radial distance from the optical axis of the fiber.

3.Transistor characteristics

1. What are the different configurations of transistor?
   The different configurations are A. common –base configurations B. common –emitter configurations C. common –collector configurations
2. What is current gain?
   It is the ratio of output current to the input current. It is also called as current amplification factor.
3. What is the relation between I_e, I_b and I_c ?
   The emitter current I_e is always equal to the sum of the base current I_b and the collector current I_c
   i.e. $I_e=I_b+I_c$
4. How base emitter and collector of a transistor are identified?
   The base-emitter connection is forward biased and the collector-base is reversed
5. What are the applications of a transistor?
   It is used as an amplifier, oscillator and integrated circuits.
6. What is transistor?
   Transistor is a three terminal two junctions semiconducting device.
7. Mention the types of transistor.
   They are two types' n-p-n & p-n-p transistors.
8. Which modes of configuration are generally used & why?
   CE mode because it has high current gain, high voltage gain, high power gain and impedance gain is very small.

9.Mention the applications of transistors.
They are used in amplifiers, oscillators, analog circuits & as a switch in digital circuits.
10.What are the differences between p-n-p and n-p-n transistor?
The first case the n type material sand witched between two p type materials. While in the second case p- type semiconductor is placed in between two n- type conductor. In p-n-p transistor majority charge carriers are holes and minority charge carriers are electrons. Where as in n-p-n transistor majority charge carriers are electrons and minority charge carriers are holes.
11.Why it is called a transistor?
A transistor is derived from the words transfer and resistor. Because transistor is a resistor that amplifies the signals as they are transferred through it from its inputs to output terminals.
12.Under normal use of transistors, how they are biased?
The emitter is forward biased and the collector is reverse biased.
13.On what factor does the characteristics of a transistor depends?
It depends upon the mode of connection. Basically, there are three modes of configuration CB, CE & CC mode.
14.What are the advantages of common emitter configuration?
High current gain, high voltage and power gain and the ratio of output impedance to input impedance is very small.

4. Charging and discharging of a capacitor

What is capacitance? What is the unit of capacitor?

Ability to store charge in a capacitor is called capacitance. The unit of capacitor is farad.

1. What is dielectric? What is its function?
   Dielectric is an insulator, which is used to increase the capacitance of the capacitor.

2. Specify the colour codes of resistors?
   0-black,1- brown,2-red,3-orange,4- yellow,5- green,6- blue,7- violet,8- gray,9- white-10

3. Give the equations for the effective capacitance of 2 capacitors in series and parallel?
   CS=C1C2/C1+C2, CP=C1+C2

4. Define electric flux?
   Total number of lines of force emitting from a charge is called electric flux.

5. Define dielectric constant?
The dielectric constant is a factor by which capacitance of a capacitor is increased when vacuum is substituted by a dielectric medium which fills the entire region where electric field would be set on subjecting the capacitor to a static electric potential.

6. What is the half time constant?
It is the time required to chare or discharge 50% of the maximum charges on the plates of a capacitor.

7. Why are the dielectrics used in capacitors?
To increase the capacitance of a capacitor. They also increase the operating voltage of the capacitor.

8. Define capacitors.
It is electrostatic device used to store electrostatic charges.

10. Mention the factors the capacitance of capacitors depends?

i) Size and shape of the capacitors ii) Dielectric constant between the plates

iii) Surface area of the capacitors iv) Distance between the plates.

11. Define one farad?
The capacitance of the capacitors is said to be one farad if one coulomb of charge required to raise the potential of one volt.

12. Give an expression for capacitance of spherical capacitors.
$C= 4\pi\, r\, \varepsilon r \varepsilon 0$ where $\varepsilon 0$ permittivity Of free space
εr is relative permittivity (dielectric constant) and r is the radius of the spherical capacitor.

13. Define dielectric constant.
It is the ratio of capacitance of a capacitor when placed in given medium to that in air.

14 What is the effect of temperature on dielectric constant of given capacitor?
As temperature is increases dielectric constant decreases.

15. What is the dielectric constant for perfect conductor? ∞ (Infinity).

16. Define half time.
The time at which voltage across the capacitor remains same, during charging and discharging is called half time.

17. Mention the types of capacitors.
    i) spherical ii) cylindrical & iii) parallel plate capacitors.

18. Mention the applications of capacitors.
    i) Used to store electric charges
    ii) Used to store Electrical energy
    iii) Used in AC circuit to control current .
    iv) Used to deflect an electron beam
    v) Used as a potential divider
    vi) Used in radio circuits for tuning
    vii) Used to separate radioactive radiations & generation detection of electromagnetic radiations.

5. Photo diode characteristics

1. What is a photodiode?

   Photodiode is a two terminal junction diode in which the reverse saturation current changes when it's reverse biased junction is illuminated by suitable wavelength of light.

2. On which principle the photodiode works?

   When a p-n junction is reverse biased, a small amount of reverse saturation current is due to thermally generated electron-hole pairs. The number of these minority charge carriers, depends on the intensity of light incident on the junction.

3. How photodiode is different from LED?

   In Photodiode the illuminated light produce a reverse saturation current but in LED's a suitable biasing current produce a photons of suitable frequency.

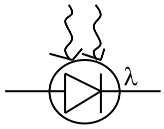
4. What factors we must consider while selecting photodiode?

   While selecting a photodiode for the required purpose it is necessary to know Wavelength of light for which it is sensitive. Operating voltage. Switching time and mounting.

5. What are the applications of Photodiode?

Photodiodes are used in detection, demodulation, switching, logic circuits, character recognition, optical communication equipments, encoders etc.

6. Write the symbol of photodiode?



7.What is optoelectronics?

It is the technology that makes use of the principles of optics and electronics.

8. Name any two optoelectronic devices.

A light emitting diode and photo diode.

6. Series and parallel LCR

1. Define resonance?
When the natural frequency of the system matches with applied frequency, the system is said to be under resonance.

2. What is the potential difference across L&C at resonance?
Since both L&C are at the same potential at resonance, potential difference is equal to zero.

3. Define power factor?
Power factor is defined as ratio of the resistance to the impedance. Power factor= resistance/ impedance.

4. How to change the resonance frequency in LCR circuit?
Changing R cannot change resonance frequency but either changing L or C, one can change it. Because that are related by an equation $f0=1/2\pi\sqrt{LC}$.

5. What is a inductor?
An inductor is a passive component used to store energy in the form of a magnetic field.

6. What is capacitor?
A capacitor is a passive used to store energy in the form of a electrostatic field.

7. What is quality factor?
It is defined as the ratio of resonant frequency to the bandwidth of the circuit. It measures the sharpness of resonance.

8. Define mutual inductance?
It is the phenomenon of inducting emf in one coil by varying the current in the other.

9. What are the applications of LCR resonant circuits?
These are widely used in radio and television receivers.

10. How the resonance happens in LCR circuit?
The capacitive reactance Xc =1/2∏fC, The inductive reactance XL=2∏fL.

11. At resonance the capacitive reactance is equal to inductive reactance and the circuit is said to be resonating. What is the condition for the resonance in LCR circuit?
At resonance, the capacitive reactance is equal to the inductive reactance,
i.e, XC=XL 1/2πfL=2pfL or LC=1/4π2 f2.

12. Why the series resonance is called an acceptor circuit and parallel is called rejecter circuit?
In LCR series, the circuit accepts one frequency component out of the rang of ac input signals and attains maximum current at that frequency known as resonance frequency. And hence the LCR series circuit is called an acceptor circuit. Similarly, the parallel resonance circuit rejects the signal of the same frequency as its own resonance frequency. LCR parallel circuit is rejecter circuit.

13. How do we identify the resonance in the LC circuit?
When LC series with the power supply, the current attains maximum at resonance frequency, where as LC is in parallel, the records minimum at the resonance frequency.

14. What is self inductance of an inductor?
The induced emf in an inductor =-L dI/dt, where L is the co-efficient of self inductance and is often referred as self inductance, dI/dt is the rate of change of current. The coefficient of self inductance is numerically equal to inductance in it when the rate of change of current dI/dt=1amp/sec.

15. What is the function of inductor?
An inductor is a coil which opposes the change of current.

16. Define the term Henry?

The inductance of the coil is said to 1 Henry is 1 volt of emf is induced in the coil when current through it changes at one amp/sec.

17. What is power factor?
It is defined as the ratio of resistance to the inductance.

18. What is resonance frequency?
The frequency at which the inductive reactance is equal to capacitance reactance.

19. Define inductive reactance XL and capacitive reactance XC.
Inductive reactance of a coil is its effective opposition offered by the inductor to the flow of current. It is given by XC=1/wC=1/2πfC.

20. What is the difference between impedance and resistance?
Impedance is the opposition to flow of ac and the resistance in the opposition to the flow of dc.

21. Why series LCR is high pass filter and parallel LCR is low pass filter?
The band width in series LCR circuit is very high & it allows large range of frequencies & in parallel, the band width is very low & it allows only small range of frequencies.

22. What is mean value of sinusoidal AC over a complete cycle?
Zero

7. Magnetic field along the axis of circular coil

1. What is magnetic field of electric current?
   When current flows through a wire magnetic field is produced around it.

2. Where does the field become maximum when current flows through the circular coil? At the centre of the circular coil the field is maximum.

3. What happens to the magnetic field if you go away from the centre of the coil?
   Field decreases on either side of the coil.

4. What is tangent law?
   When a magnetic needle is placed between two mutually perpendicular uniform magnetic fields. Needle is deflected making an angle Θ with the deflecting field. B=BH tan Θ.

5. Why do you set the plane of the coil in the direction of BH?

To satisfy tangent law.

6. What are the initial adjustments in the experiment?
   A) Plane of the coil must be set parallel to BH
   B) Aluminum pointer should read 0-0.

7. Why do you take two deflections Θ1 and Θ2?
   To eliminate eccentric error i.e. centre of the magnetic needle may not be exactly at the centre of the circular degree scale.

8. Which law is used to derive the magnitude of magnetic field along the axis of a circular coil carrying current?
   Biot-Savart law

9. What is the meaning of μ_o and what is the value of it?
   It is a proportionality constant known as permeability of medium. permeability is the measure of the ability of a material to support the formation of a magnetic field. Its value is 4πx10-7 N/A2.

10. Does the horizontal component of the earth's magnetic field varies?
    Yes the horizontal component of the earth's magnetic field varies greatly over the surface of the earth. Its magnitude is around B_H = $3.5x10^{-5}$ T.

9. Fermi energy of given conductor

1. What is meant by Fermi energy?

It is the energy of the highest occupied level at zero absolute.

2. What is relation between EF&TF?
   EF=kBTF

3. What is meant by Fermi temperature?

It is the temperature at which the average thermal energy of the free electrons in a solid becomes equal to the Fermi energy at 0o K. it is this temperature at which gas be considered degenerate. It depends on mass of fermions and energy.

1. What is Fermi velocity?
   It is the velocity of those electrons, which occupy the Fermi level.

2. Are the energy levels lying above EF are empty at 0 K?
   Yes, they are empty, but EF are filled.

3. What is the effect of atomic number Z on EF & TF?
   As Z value decrease EF&TF increase.

4. Define mobility of electrons?
   In addition to the thermal motion, electrons drift due to the applied field. The magnitude of the drift velocity per unit field defined as the mobility of electrons.

5. Define electrical conductivity?
   Electrical conductivity is defined as the current density per unit electric field. In terms of electron mobility μ, electrical conductivity σ= re μ.

6. Define mean free path?
   The average distance traveled by an electron between two successive collisions inside a metal in the presence of applied field is known as mean free path.

7. What is meant by Fermi energy?
   It is the maximum energy that electrons in a metal can posses at absolute zero of temp.

8. Define energy level and its importance.
   It is the highest reference energy level of an electron (particle) at absolute zero of temp. It is the reference energy level which separates the filled energy level and vacant energy level.

9. What is meant by Fermi temperature?
   The temp at which the average thermal energy of the free electron in a solid becomes equal to Fermi energy at absolute zero of temp.

10. What is meant by Fermi velocity?
    The velocity of an electron which occupy the Fermi level is called Fermi velocity.

11. What is meant by conductors?
    The material which conduct electric current when a potential is applied across them.

12. What is meant by insulators?
    The material which does not conduct electric current under normal condition.

13. What are fermions?
    Particles with odd half integral spins (1/2, 3/2, 5/2 etc.) are fermions. Fermions obey the Pauli's exclusion principle.

14. State Ohm's Law.
    The current flowing through the conductor is directly proportional potential across its ends.

15. Define valance band?
    The outer most orbital of an electron are called valance electron. These electrons occupied by a band called valance band.

16. Define conduction band?
It is lies next to the valence band. It is empty band or partially filled electron band at absolute temperature.

17. What is meant by free electron?
It is an electron which moves freely or randomly in all direction in the absence of external field.
OR The outer most orbital of an electron are called valance electron or free electron
.

18. How the resistivity does vary with temperature in case of conductors?
Resistivity of conducting material is constant at lower temperature. For higher temperature resistivity is proportional to T.

19. Mention the types of semiconductor.
There are two types i) Intrinsic semiconductor & ii) Extrinsic semiconductor

10. Study of motion using spread sheets

Department of Physics

Vision

Blending Physics concepts with cutting edge technologies in Engineering disciplines.

Mission

Training students with the concepts of oscillations, waves, laser, quantum mechanics and electrical conductivity to apply in their respective discipline.

Inculcating students with systematic and research approach on material characterization techniques.

Encouraging students to take up innovative ideas in applied Physics with experimentation.