Roll No._____   CLASS._____

VIVEKANAND EDUCATION SOCIETY'S
INSTITUTE OF TECHNOLOGY
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Chembur, Mumbai- 400074
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CERTIFICATE

certified that Mr./Miss_____

of FE Branch_____has satisfactorily

completed a course of the necessary experiments in Engineering

Physics Sem I/II under my supervision in the Institute of

Technology in the year 2020-2021.

 Subject Teachers   Lab In Charge

Dr. Shashwati Roy Majumder   Dr Shashwati

Dr. Manisha Tiwary

Dr. Jessy P.J.

Head of Department   Principal

Mr. Vivek Umrikar   Dr.(Mrs) J.M.Nair

VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY

Department of Humanities and Applied Sciences

FEC-202   **Engineering Physics – II**

Outcomes: Learner will be able to…
1) Perform the experiments based on diffraction through slits using Laser source and analyze the results.
2) Perform the experiments using optical fibre to measure numerical aperture of a given Fibre.
3) Perform the experiments on various sensors and analyze the result.

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Sr. No.	Name of Experiment	Date of preparation	Date of Submission	Co mapping	Grade	Signature
1						
2						
3						
4						
5						

Class: Roll No:
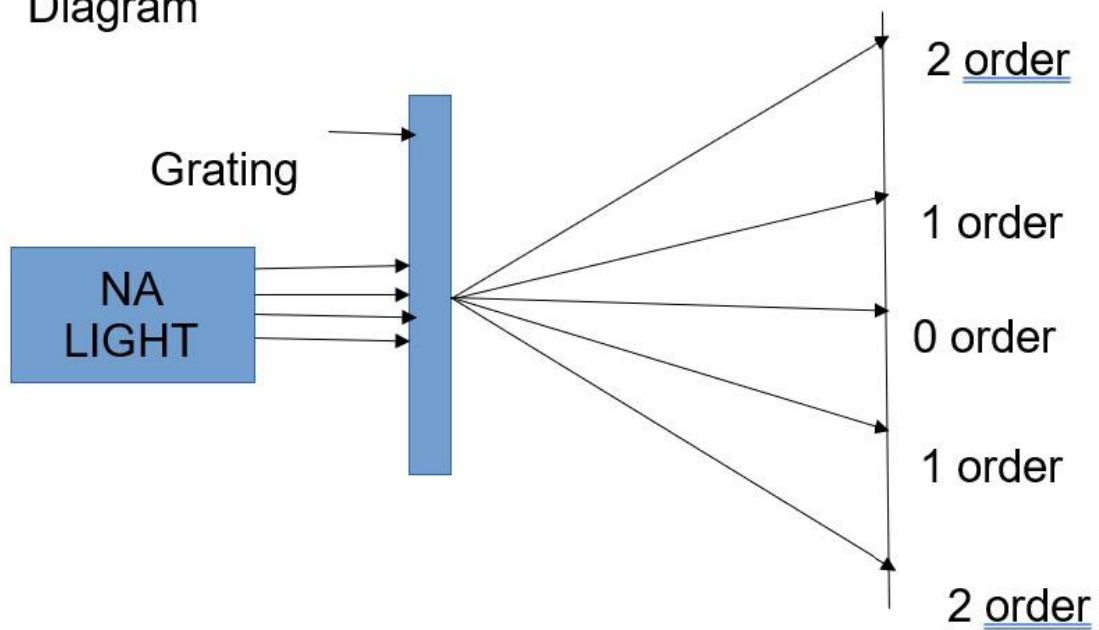
Experiment No:1

To Determine the Wavelength of Sodium Light using a Diffraction Grating and Spectrometer.

Date Of Preparation:

Date of Submission:

Signature of Teacher:

Diagram

Grating

NA
LIGHT

2 order

1 order

0 order

1 order

2 order

Schematic diag. for diffraction of Na light by
Grating and Spectrometer

EXPERIMENT NO. 1

AIM: **To determine the wavelength of sodium light using a diffraction grating and spectrometer**

APPARATUS : Diffraction grating, spectrometer, Sodium lamp, reading lens

THEORY: A plane diffraction grating is an arrangement of a large number of identical equidistant parallel slits. When a beam of monochromatic light is incident normally on the grating surface, it gets diffracted through various angles to give a diffraction pattern made of zero order, first order, second order and higher orders depending on the grating element d, (distance between two consecutive slits) and the wavelength of light being used. The grating equation relates the grating element (d), the wavelength of incident light (λ) and the angle of diffraction (Θ) for a given order (m) and is given by

$$d \sin \Theta = m \lambda$$

OBSERVATION TABLE: Grating Element (d) = (2.54/15000) cm

Order of maxima (m)	Spectrometer reading (L.H.S.) a (degrees) (MSR + VSR)	Spectrometer reading (R.H.S.) b (degrees) (MSR + VSR)	(a~b)= 2Θ	Angle of diffraction (Θ)	Calculated wavelength (λ) (Å)	Average wavelength (λ) (Å)
0						
1						
2						

CALCULATIONS: **d sin Θ = m λ   (m-1)**

d sin Θ = m λ   (m-2)

RESULTS :   The Average calculated value of wavelength =   _____ (Å)

The standard value of wavelength   =   _____ (Å)

Percentage Error   =   _____ %

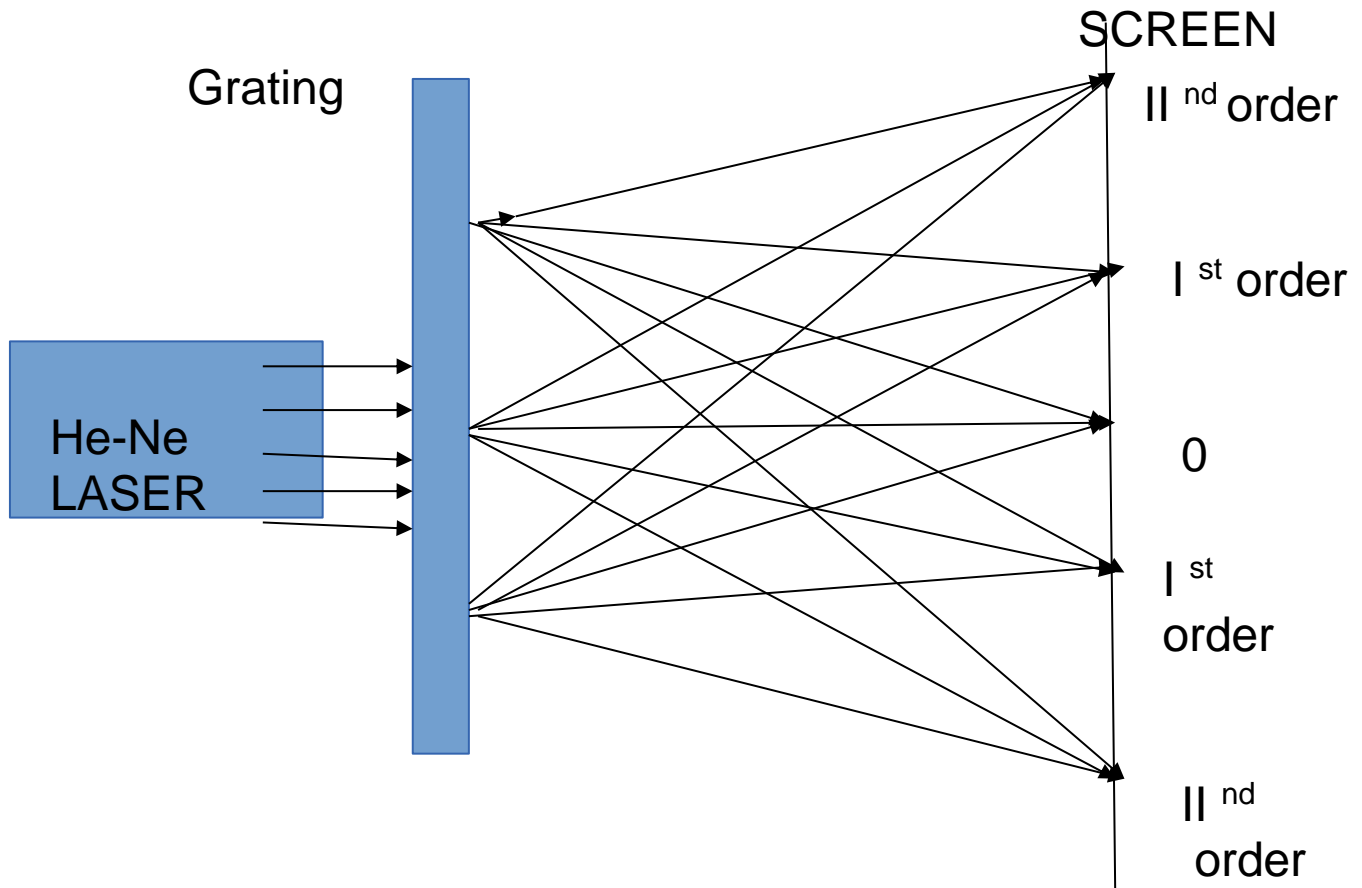Class: Roll No:

Experiment No:2
To Determine the Wavelength of He-Ne LASER
using a Diffraction Grating.

Date Of Preparation:

Date of Submission:

Signature of Teacher:

Diagram:

SCHEMATIC DIG.FOR He-Ne LASER DIFFRACTION THROUGH GRATING

EXPERIMENT NO. 2

AIM: **To determine the wavelength of the He-Ne LASER using a diffraction grating**.

APPARATUS: LASER light source (He-Ne laser), diffraction grating and a meter scale

THEORY: LASER stands for Light Amplification by Stimulated Emission of Radiation. In He-Ne LASER the active medium is a mixture of He and Ne, and it is a four-level laser. A grating is an arrangement of a number of identical parallel slits. When a beam of LASER light is incident normally on the surface of a grating it gets diffracted to form a diffraction pattern made of zero order, first order, second order and higher orders depending on the grating element. The angle of diffraction (Θ) or each order (m) with respect to the direction of non-diffracted beam, the grating element (d) and the wavelength of incident light (λ) are related by the equation known as GRATING EQUATION, viz. **d sinΘ = mλ**

OBSERVATION TABLE: Grating Element (d) = 2.54/15000 cm

Sr. No.	Distance of grating from the screen D(cm)	Order of diffraction (m)	Distance between two maxima of same order (2X)	X (cm)	tanΘ= X/D
1					
2					
3					

CALCULATIONS:

Sr. No.	Angle of Diffraction (Θ)	Sin (Θ)	Wavelength λ (Å)	Mean λ(Å)
1				
2				
3				

RESULTS:

Calculated wavelength of He-Ne LASER = _____(Å)

Standard wavelength of He- Ne LASER = 6328 (Å)

Percentage Error = _____

Class: Roll No:
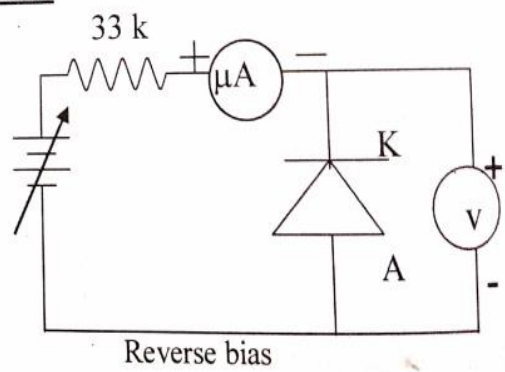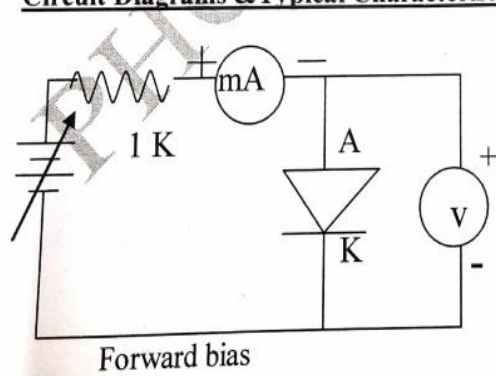

Experiment No: 3

Study of I-V Characteristics of given photodiode.

Date Of Preparation:

Date of Submission:

Signature of Teacher:

Circuit Diagrams &Typical Characteristics Curve:

Forward bias

Reverse bias

EXPERIMENT NO. 3

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

APPARATUS: Commercial setup with following components: Photodiode, variable light source with lamp (1to12v),Regulated power supply V (0 to 20V) with Ammeter and Voltmeter. Patch cords

THEORY: A silicon photodiode is a solid state light detector that consists of a shallow diffused P-N junction with connections provided to the outside world. When the top surface is illuminated, photons of light penetrate into the silicon to a depth determined by the photon energy and are absorbed by the silicon generating electron hole pairs. The electron-hole pairs are free to diffuse (or wander) throughout the bulk of the photodiode until they recombine. The average time before recombination is the "minority carrier lifetime". At the P-N junction is a region of strong electric field called the depletion region. It is formed by the voltage potential that exists at the P-N junction. Those light generated carriers that wander into contact with this field are swept across the junction. If an external connection is made to both sides of the junction a photo induced current will flow as long as light falls upon the photodiode. In addition to the photocurrent, a voltage is produced across the diode.

Plot the graph:

Diode Current against Distance.

OBSERVATION TABLE:

Forward Bias		Reverse Bias	
V (volt)	I (mA)	V (volt)	I (mA)

Class: Roll No:
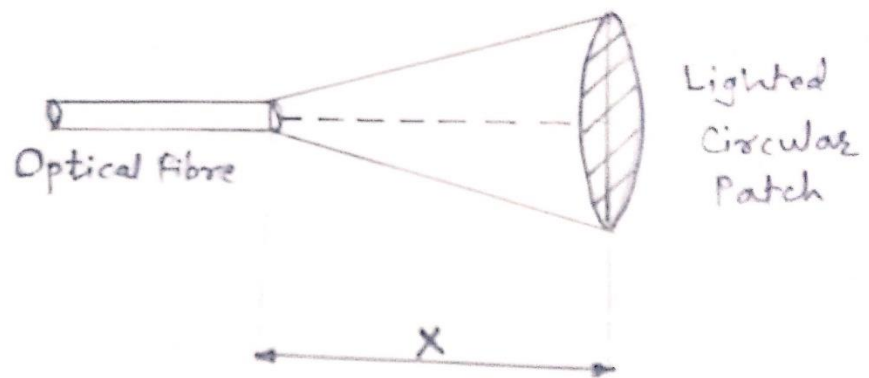

Experiment No: 4

To Determine Numerical Aperture of a given optical Fibre.

Date Of Preparation:

Date of Submission:

Signature of Teacher:

Diagram:

Schematic Diagram for Numerical Aperature measurement of optical fibre.

EXPERIMENT NO. 4

Aim: To Determine Numerical Aperture of given optical Fibre.

Apparatus: Fibre Optics, Numerical Aperture measurement kit, Patch Cords, one side connectorized fibre cable.

Theory: Numerical Aperture is a measure of light gathering capacity of an optical fibre. If the Refractive Indices of the core and cladding of an optical fibre is n1 and n2 respectively. Then Numerical Aperture is defined as: $\sqrt{n_1^2 - n_2^2}$

If the acceptance angle of the given fibre is θ and refractive Index of surrounding medium is no than NA= nosin θm. For optical fibre in air (no=1) NA=sinθm.

If 'x' is the perpendicular distance of the tip of the fibre from the screen and 'r' is the radius of the circulator patch of the lighted portion of the screen then:

$$NA = \sin\theta m = \frac{r}{(x^2+r^2)^{\frac{1}{2}}}$$

Observation Table:

Sr.No	X (cm)	Diameter			r (cm)	$\sin\theta m = \dfrac{r}{(x^2 + r^2)\,\frac{1}{2}}$ (Numerical Aperture)
		D1	D2	Avg		
1						
2						
3						
4						
5						

Result:

Calculated Numerical Aperture: _____

Standard Value of Numerical aperture: 0.2 – 0.6

Class: Roll No:
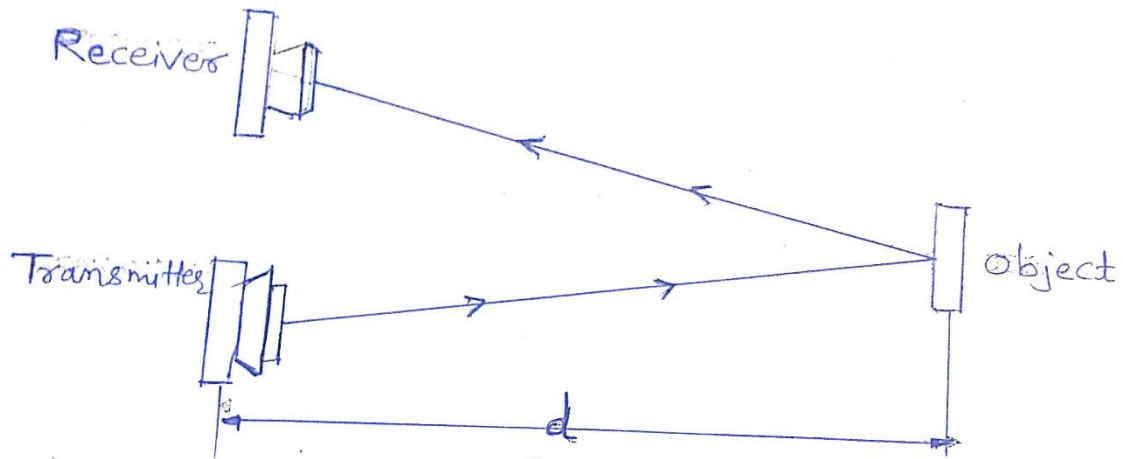
Experiment No:5
Determination of distance of a given object
from a specified point using Ultrasonic
Distance Meter.

Date Of Preparation:

Date of Submission:

Signature of Teacher:

Diagram:

$$\frac{\cdots 64}{64} \times 100 = 0.78\%$$

Receiver

Transmitter

Object

d

Schematic diagram for Measurement of
Distance using Ultrasonic Distance meter.

EXPERIMENT NO. 5

Aim: To determine the distance of an object using Ultrasonic Distance meter.

Equipments: Ultrasonic Distance meter Kit, Measuring Tape, Object (where distance is to be measured.

Theory: Ultrasonic beams can be produced in the form of directed beams like beams of light. Further, they travel quite a large distance and are unidirectional. While travelling, whenever ultrasonic waves encounter an obstacle, they reflect back. As a result, they are used to measure distances. The source sends out short pulses of ultrasonic waves and the receiver receives the reflected waves. The distance can be calculated using the Formula $2d = \mathcal{V} \times t$
Where, d = distance between transmitter and the object
$\qquad \mathcal{V}$ = velocity of ultrasonic wave in air
$\qquad$ t = time lag between sending and receiving back the signal

Observation Table:

Sr.No	Measured Distance d (inches)	Observed Distance 2d (inches)	Calculated Distance d (inches)	Percentage Error %	Average Percentage Error %
1					
2					
3					
4					
5					
6					