Department of Physics
Indian Institute of Engineering Science & Technology, Shibpur
(Formerly Bengal Engineering & Science University, Shibpur)
P.O: Botanic Garden, Howrah – 711103, West Bengal, India
Website : http://www.iiests.ac.in

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Notice Inviting Quotation

Sealed quotations are invited for supply of the following items/equipment or to carry out works listed below as per mentioned specifications. The relevant bidding document can be downloaded from the website. The document can be also obtained from the Department of Physics **(Contact: Head, Department of Physics)** between 11.00 a.m. and 5.00 p.m. on all working days. The quotation should **include all kinds of taxes/duties and delivery, Installation charges etc** of the items and to be sent to the Office of the **Head, Department of Physics, IIEST, Shibpur, Howrah-711103**. Last date of submission of sealed quotation is **7 working days from the date of publication** in the Website of the Institute and tenders will be opened on the next working day at 12 noon.

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Item 1: **Travelling Microscope 3D**
Quantity: 4

Technical specifications:

Movement: 3-Motion, Minimum movement 250mm in each direction.

Vernier Constnt: 0.01mm

Eye Piece : 10X magnification, Ramsden type.

Telescope tube settings: Can be set horizontally & vertically

Base Screw: 3 Leveling Screw.

Item 2: **Numerical Aperture Setup**
Quantity: 1

Technical specifications

Diode Laser & Stand, Optical Fiber 1 m, Adapter, Turn table, Detector & Display unit

Item 3: **Lattice Dynamics Setup**
Quantity: 1

Technical specifications

Lattice Vibration are stimulated using transmission line having ten identical set of LC Resonant. Determination of the cut off freq. the dispersion relation for the diatomic lattice acoustical mode and optical mode energy gap.

Item 4: **Ultrasonic interferometer (Raman-Nath effect)**
Quantity: 1

Technical specifications

Raman-Nath effect Experiment Complete set, (Spectrometer, Crystal oscillator with suitable frequency and power supply, Na-Vapour Lamp with its power source, Liquid Vessel etc)

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Item 5: **Spectrometer**
Quantity: 3

Technical specifications:

Diameter: 9 inch
Number of vernier: 2
Vernier constant: 20 Sec
Movement of Telescope/collimator: Telescope/collimator should move vertical and horizontal direction.
Eye piece: 10X, Ramsden type.
Prism Table: Rotatable about its own vertical axis.

Item 6: **Electron Spin Resonance Spectrometer (ESR)**
Quantity: 1

Technical specifications:

1. **Power supply**

A. DC power Supply

The ESR circuit requires a highly stabilised almost ripple free voltage .
Specifications:

- DC Voltage : 20V
- Load Regulation : 0.3%
- Line Regulation : 0.01%
- Ripple : < 3mV
- Long Term Stability : 0.1% per 1000hrs.

B. **Helmholtz coils power Supply :** Helmholtz coils power Supply consists of a step down transformer (220V – 35V AC) separate winding on the main transformer, a potentiometer (12-15W)and amoving coil rectifier type meter.

2. **Helmholtz coils :** There two cois exactly alike and parallel to each other,so connected hat current passes through in the same direction**.**

Specifications:

- Number of turns : 500 in each coil
- Diameter of the windings : 15.4 cm
- Separation of ofthe coil : 7.7cm.

3. Test Sample : Diphenyl Picryl Hydrazyl (DPPH)

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4. R. F. Oscillator :

Specifications:
Frequency range : 9.5 MHz - 18.0 MHz
Accuracy : Better t5han 0.5 %

5. Controls and Terminals :

- Mains : To switch ON or OFF the ESR Spectrometer.
- Sensitivity : To adjust the amplitude of output signal.
- Phase : The adjust the phase between X and Y Plates signals.
- Current : To control the current in Helmholtz coils
- 'H 'coils : Terminals and switch for Helmholtz coils
- Frequency : To adjust the frequency of the oscillator .
- X,Y,E : For X,Y and earth terminals of the oscilloscope

Item 7: **Study of Dielectric Constant and Curie Temperature of Ferroelectric Ceramics**
Quantity: 1

Technical specifications:

1. Probes Arrangement

It has two individually spring loaded probes. The probes arrangement is mounted in a suitable stand, which also holds the sample plate. To ensure the correct measurement of sample temperature, the RTD is embedded in the sample plate just below the sample. This stand also serves as the lid of temperature controlled oven. Proper leads are provided for connection to Capacitance Meter and Temperature Controller.

2. Sample
Barium Titanate ($BaTiO_3$)

3. Oven
This is a high quality temperature controlled oven. The oven has been designed for fast heating and cooling
rates, which enhances the effectiveness of the controller.

4. Main Units
The Set-up consists of two units housed in the same cabinet.
(i) Oven Controller
Platinum RTD (A class) has been used for sensing the temperature. A Wheatstone bridge and an instrumentation amplifier are used for signal conditioning. Feedback circuit ensures offset and linearity
trimming and a fast accurate control of the oven temperature.

SPECIFICATIONS

- Temperature Range : Ambient to 200°C
- Display : 3½ digit, 7 segment LED with autopolarity & decimal indication
- Resolution : 0.1°C
- Accuracy : □0.5°C (typical)
- Stability : □0.1°C
- Power : 150W

(ii) Digital Capacitance Meter
This a compact direct reading
Instrument for the measurement of
capacitance of the sample.

SPECIFICATIONS

- Range : 50-6000 pf
- Resolution : 1pf
- Display : 3½ digit, 7 segment LED

Item 8: **Determination of Planck's Constant and Work Function of Materials by Photoelectric Effect**
Quantity: 1

Technical specifications:

THE APPARATUS CONSIST OF THE FOLLOWING :

A. Photo Sensitive Device : Vacuum photo tube.

B. Light source : Halogen tungsten lamp 12V/35W.

C. Colour Filters : 635nm, 570nm, 540nm, 500nm & 460nm

D. Accelerating Voltage : Regulated Voltage Power Supply
Output : □□15 V continuously variable through multi-turn pot
Display : 3 ½ digit 7-segment LED
Accuracy : □0.2%

. **E. Current Detecting Unit :** Digital Nanoammeter
It is high stability low current measuring instrument

Range : 1000 □A, 100 □A, 10 □A & 1□A with 100 % over ranging facility
Resolution : 1nA at 1 □A range
Display : 3 ½ digit 7-segment LED
Accuracy : □0.2%

E. Power Requirement : 220V ± 10%, 50Hz.

F. Optical Bench : The light source can be moved along it to adjust the distance between light source and phototube. Scale length is 400 mm. A drawtube is provided to install colour filters, a focus lens is fixed
in the back end.

Item 9: **MAGNETIC FIELD MEASUREMENT APPARATUS**
Quantity: 1

Technical specifications:

The experiment consists of two coils, Constant Current Power Supply and Gaussmeter. The Gaussmeter probe is mounted on a rail with a scale. It can move smoothly and precisely for measurement of magnetic field along the centre of the coils.

The following studies on Biot Savart's law can be carried out with the set-up:

1. Study of magnetic field due to one coil and calculation of its diameter.

2. Study of Principal of super-imposition of magnetic field due to 2 coils by keeping the distance between the coils at a, >a and <a, where a is the radius of the coil.

3. Variation of magnetic field with number of turns in the coil.

***Apparatus consists of the following*:-**

1. Digital Gaussmeter

Range: 0-200
Resolution: 0.1G
Accuracy: + 0.5%
-
Display: 3½ digit 7 segment LED with autopolarity.

2. Two Coil

Diameter: 200mm
Number of turn: 1000

3. Constant Current Power Supply

Current: 0-0.5A Smoothly adjustable
Line Regulator: + 0.2%for 10% mains variation.
–

Load Regulator: + 0.2 % for 0 to full load
–

Display: 3½ digit 7 Segment LED Display
Protection: Against overload/ short current.
The 2 coils are mounted on platform one coil is fixed and other coil move smoothly on a rail along with the axis of the coils.

Item 10: **Frank Hertz Experiment**
Quantity: 1

Technical specifications:

Frank-Hertz Experiment Set-up consists of the following items :

- _ Argon filled tetrode
- _ Filament Power Supply : *2.6-3.4V continuously variable*
- Grids Power Supplies
- VG1K : *1.3-5V continuously variable*
- VG2A : *1.3 - 12V continuously variable*
- VG2K : *0 - 95V continuously variable*

All the power supplies are highly stabilised and output voltages can be read on 3½ digit, 7 segment LED DPM with auto polarity and decimal indication through a selector switch

- _ Saw tooth waveform for CRO display
  - *Scanning Voltage : 0-80V*
  - *Scanning Frequency : 115±20Hz*
- _ Multirange Digital Ammeter
  - *Display : 3½ digit 7 segment LED*
  - *Range Multiplier : 10-7, 10-8 & 10-9*
- _ Power :*220V±10% mains, 50Hz*

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Item 11: **MEASUREMENT OF ELECTRON CHARGE TO MASS RATIO**
(based on Thomson's method)
Quantity: 1

Technical specifications:

e/m Experimental Set-up :

DESCRIPTION OF THE EXPERIMENTAL SET-UP

The central part of the set-up is the e/m-tube. This is energized by

- Filament current supply,
- Deflection plates voltage supply,
- Continuously variable accelerating voltage supply to the anode

The tube is mounted on a rotatable socket and is placed between a pair of Helmholtz coils. The tube can be rotated about a vertical axis, varying the orientation of the electron beam with respect to the Helmholtz coils.This allows deflection of the beam to be demonstrated for various orientations of the beam direction, circular, helical or undeflected paths can be seen. The direction of the current can be changed. The magnetizing current I and the accelerating voltage V are respectively measured by an ammeter and a voltmeter mounted on the front of the panel. The diameter of the electron beam path is measured by a detachable scale mounted in front of the bulb of the tube. This scale has a slider with a hollow tube (fitted with cross wires at its both ends) to fix the line of sight while making the measurements of the beam path diameter. Base of the unit contains the power supply that provides all the equired potentials and the current to the Helmholtz coils.

Specifications :

- Helmholtz coils of radii : 14 cm
- Number of turns : 160 on each coil
- Accelerating Voltage :0 – 250V
- Deflection plates voltage :50V – 250V
- Operating Voltage : 220V AC/ 50Hz

Item 12: **Polarization of Light and Verification of Malus Law**
Quantity: 1

Technical specifications:

Optical Bench
Specification

Material	:	Aluminum alloy
Type	:	Hexagonal Section
Scale	:	0-100cm
Least count	:	1mm

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He-Ne LASER
Specification

Wavelength : 632.8nm
Working Current : 4mA-6mA
Output power : >2mW
Contour Dimension
(Outer diameter x length): f40mmx250mm
Continuous working time : >8hrs
Working voltage : AC220V±22V
Input Power Rating :<2W
Contour Dimension : 300x62x82mm
Weight : 1.5kg(approx)

Photo Detector
Specification

Dectector : Silicon photocell
Terminals : 4mm safty socket
Aperture : 1mm
Rod : 10mm diameter

Polarizer / Analyzer
Specification

Angle : Adjustable (0^0- $\pm 90^0$)
Least count : 1^0
Apeture : 21mm dia
Frame : 130mm dia to avoids scattering of lights
Rod : 10 mm dia

Digital Multimeter
Specification

Resistance : 200Ω,2000Ω,20k,200k & 2000kΩ
D.C. Voltage : 200 & 2000mV 20, 200 & 600V
A.C. Voltage : 200 & 600V
D.C. Current : 200 & 2000µA
: 20&200mA
: 10A
Testing : Diode & transistor
Battery : 9V

Transverse Saddle
Specifications

Material : Aluminum
Locking : Spring loaded
Motion: X-Y axis
Holder : 10mm dia

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Connecting Lead
Specification
Length : 100cm
Type : Banana plug

Item 13: Faraday's Law & Induced E.M.F
Quantity: 1

Technical specifications:

Data Logger
Specification

Computer Connection : Micro USB & Blutooth
Maximum sampling rate : 100000 samples per second
Inputs channels : 4
Power : Micro USB
Resolution sampling : 12bits
External sensors : +65

Digital Timer & Photogate
Specifications

Display : 2 line LCD
Type : Micro controller based
Time resolution : 0.1 milli second
Mode : Time, Speed & Acceleration
Photogate : 2 nos.
Interface : USB
Operating voltage: 5V DC
Photogate detector: Intra-Red

Voltage Sensor
Specifications

Input voltage range: +/- 25 V
Accuracy: +/- 3% over entire range
Resolution: 12 bit, 12.5 mV
Input resistance: 250KOhm
Maximum sample rate: 20000 sample/ Sec

Standard Coil Sets, Plastic tube, Universal Clamp Cylindrical magnet, Boss head, Support base and rod

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Item 14: **Balmer series and Rydberg constant**
Quantity: 1

Technical specifications:

Advanced spectrometer

Specification:
Scale: Brass diameter 175 mm
Objective: Acromatic lens, focal length 178 mm, aperture 32mm
Slit: German silver with Knurled screw
Reticle: 90^{o} cross etched on glass
Least count: 20Sec
Eye piece: 15x Ramsdens
Vernier: 4 verniers (Telescope and prism table)
Base: 220 mm dia Aluminium casting
spindle and other critical components

Spectrum tube Power supply Specification:

Input voltage: 220 Volt, 50 Hz AC

Output voltage: 0 to 5000 Volt (Open ckt)

Overload: 2 mA (Max) with reset switch

Socket: Spring loaded

Protection window for tube with red switch for safe operation

Diffraction grating having size 89x38 mm, Aperture size 16x9mm, rulings 100, 300, 600 lines/mm

Prism having size 38x38x38mm with EDF material

Iron Allen key with 3mm diameter

Hydrogen tube with Wavelength 420, 440, 490, 670 nm

Better zoom hand held magnifier with LED of dia 6-8 cm with FL 5cm

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Item 15: **Permeability and Permitivity**
Quantity: 1

Technical specifications:

Coulomb and Current Balance

Specification:

Base dimension: 30 cm x 35.5 cm

Leveling: 2 nos. threaded knobe

Connection: 4 mm safety socket

Level position: 25.5 cm

A sensitive balance with adjustable counter weight and an optical lever for measuring tiny forces by the null method

Straight conductor: L= 33.5 cm, dia = 3 mm,Aluminium

Straight conductor: l=26.5 cm, dia = 3 mm, Aluinium U-type
maximum current 20Amp

Parallel plate: 15.5 cm x 12.5 cm x 0.8 mm (L x W x T)

Material : Aluminium

Maximum current: 20 Amp

Complete with base uni, pair of straight conductor, pair of parallel plates and plane mirror

Power Supply Specification:

Input voltage: 220 Volt, +/- 5%, 50 Hz AC

Output voltage: 0 to 30 Volt

Voltage resolution: 0.1 V

Voltage & Current display: Digital LED

Output current: 0-20 Amp

Current resolution: 0.1 Amp

Primary fuse 8 Amp, current Limiter protection

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Diode Laser specification:

Peak wavelength: 635 nm

Operating voltage: 5V DC

Operating current: 250 mA

Optical power: 0.4-0.8 mW

Laser product: Class II

Operating temp: 0-40^{o}C

storage temp.: -10 to 50^{o}C

Weight box specification:

weights: set of 8, 1mg to 50 gms with Nickel plated brass, fractional weight of Aluminium

High voltage Power Supply Specification:

Input voltage: 220 Volt, +/- 5%, 50 Hz AC

Output voltage: 0 to 600 V DC

Voltage resolution: 10 V

Voltage: Analog

Short circuit current: 100µAmp

Cylindrical Base specification:

Ferrous rod of 10-14mm dia, flat object up to 10 mm

Groove (L x W): Slide object, 30 x 10 mm

Diode laser adaptor, wooden scale (100 cm), Resistance module, Flexible plug leads (50 cm), Yellow, Flexible plug leads (100 cm), red & black, measuring tape 3 metre.

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Item 16: **Measurement Of Magneto resistance of Semiconductors:**
Quantity: 1

Technical specifications:

DESCRIPTION OF THE EXPERIMENTAL SET-UP

The set-up consists of the following:

1. Four probe arrangement,
2. Sample: (Ge: n-type)
3. Constant Current Source,
4. Digital Microvoltmeter,
5. Electromagnet,
6. Constant Current Power Supply,
7. Digital Gaussmeter

1. Four Probe arrangement

It consists of 4 collinear, equally spaced (2mm) and individually spring loaded probes mounted on a PCB strip. Two outer probes for supplying the constant current to the sample and two inner probes for measuring the voltage developed across these probes. This eliminates the error due to contact resistance which is particularly serious in semiconductors. A platform is also provided for placing the sample and mounting the Four Probes on It.

2. Sample

Ge Crystal (n-type) dimensions: 10 x 10 x 0.5mm.
(Standard Sample included to enable the user to check the functioning of the setup)

3.Constant Current Source,

(for low resistivity to medium resistivity samples)
It is an IC regulated current generator to provide a constant current to the outer probes irrespective of the changing resistance of the sample due to change in temperatures. The basic scheme is to use the feedback principle to limit the load current of the supply to preset maximum value. Variations in the current are achieved by a potentiometer included for that purpose. The supply is a highly regulated and practically ripples free d.c. source. The constant current source is suitable for the resistivity measurement of thin films of metals/ alloys and semiconductors like germanium.

Specifications

- *Open Circuit Voltage* : 10 V
- *Current Range* : 0-20mA, 0-200mA
- *Resolution* : 10□A
- *Accuracy* : □ 0.25% of the reading □ 1 digit
- *Display* : 3½ digit, 7 segment LED with autopolarity and decimal indication
- *Load Regulation* : 0.03% for 0 to full load
- *Line Regulation* : 0.05% for 10% changes

4. D.C. Microvoltmeter

Specifications:

- Range : 0 – 200mV, 0 -2V (100uV mim.)
- Accuracy : +. 0.1 %

5. Electromagnet
Specifications:

- **Field Intensity**
  11KG at 10mm air-gap with flat pole pieces
- **Pole Pieces**
  75mm diameter
- **Energising Coils**
  Two, each having a resistance of about 12□
- **Power Requirement**
  a. 0-90Vdc, 3A, if coils are connected in series.
  b. 0-45Vdc, 6A, if coils are connected in parallel
- **Weight:** 81Kg

6. Constant Current Power Supply:
Specifications :

- **Current Range:**
  Up/ Down switch operated, 0-3A per coil, i.e. 6A
- **Load Regulation**
  0.1% for load variation from 0 to max.
- **Line Regulation**

0.1% for ±10% mains variation

- **Display:** 3½ digit, 7 segment LED DPM

- **Power:** 220V ±10%, 50Hz
- **Weight:** 13Kg

Dimensions: 340mm X 350mm X 235mm

7. Digital Gaussmeter :

Specifications :

- Range : 0 – 2KG, 0- 20KG
- Accuracy : +_ 0.5 %
- Display : 3 $^{1}/_{2}$ digit, 7 segment LED display with auto polarity and overflow indication.

- Transducer : Hall prove (InAs)

Item 17: **Determine the wave length of sodium lamp by Newton's Ring method (complete Setup)**
Quantity: 1

Technical specifications

FEATURES AND FUNCTIONALITY PARAMETERS

- Availability of On Board Circuit for 10. Others
- If other then indicate the type of On Board Circuit NA
- Type of On-board meter available Analog
- Number of Potentiometers provided onboard to vary load resistance 2
- Number of variable DC power supply available on board 1
- Variable DC power supply (in volts) 30
- Number of LED indicators available to indicate Power input 2
- Availability of DC Voltmeter available on board Yes
- Range of DC Voltmeter (in volt) 0-60
- Availability of DC Ammeter on board Yes
- Range of DC Ammeter (in milli Ampere) 0-100
- Number of test points provided onboard to observe signals 10
- Necessary patch cords available for interconnection Yes
- Casing Material Wooden
- Availability of CD (Soft Copy) with sample project code, simulation for network theorem kit software & useful documents No
- Any other features NA
- OPERATING CONDITION
- Indicate operating input power supply requirements 240

- Min Operating temperature for Network Theorem Kit in degree Celsius -5
- Max Operating temperature for Network Theorem Kit in degree Celsius 55
- Operating Humidity for Network Theorem Kit (RH)90%
- TEST CERTIFICATION AND PAST EXPERIENCE
- Whether the offered kit tested at Central Govt / NABL approved / ILAC accredited Lab, any NABL accredited lab, govt lab/international lab to prove conformity to the specification No
- If Yes, Test Report to be furnished to the Buyer on demand YES
- Indicate the name of the lab where test report available MEIPL AMBALA
- Indicate the test certificate number & date QCC/18-19/32
- Whether manufacturer of offered product has national/international certification (such as ISO, TUV, etc) Yes
- Indicate name of certification agency & certificate number and date ISO
- Institute where the offered Network Theorem kit supplied in the past NIT
- If other then Specify the names of the institute where the Network Theorem kit supplied in the past with complete address NIT RAIPUR
- Authorization certificate to be furnished to the Buyer on demand NA
- GENERIC PARAMETERS
- Installation and Demonstration included in the scope of supply Yes
- List of items and its number included in the offered package 3
- Supplied with comprehensive user manual Yes
- Warranty of Network Theorem kit 1

Item 18: **Power Supply For Hall Effect Set-Up**
Quantity: 2

Technical specifications:

This power Supply is designed to be used with the Electromagnet, as a constant current power supply to generate magnetic field upto 11KG. The current requirement of 3A per coil, i.e. a total of 6A is met by connecting six closely matched constant current sources in parallel. In this arrangement the first unit works as the 'master' with current adjustment control. All others are 'slave' units generating exactly the same current as the master. All the six constant current sources are individually IC ontrolled. The current is set by Up/ Down push button switches under the control of a icrocontroller. The embedded software further ensures low power dissipation by selecting the primary and secondary tappings of the mains transformer approximately. The unit is therefore capable of continuosly operations for long periods. The supply is protected against overload, short circuit and transients caused by the load inductance.

Specifications :

- **Current Range:** Up/ Down switch operated, 0-3A per coil, i.e. 6A

- **Load Regulation:** 0.1% for load variation from 0 to max.

- **Line Regulation:** 0.1% for ±10% mains variation
- **Display:** 3½ digit, 7 segment LED DPM
- **Power:** 220V ±10%, 50Hz
- **Weight:** 13Kg
- **Dimensions:** 340mm X 350mm X 235mm

Terms & Conditions:

a. Price should include Deliver and installation charges and taxes.

b. Warranty for the Instrument at least of 12 months. .

c. Delivery has to be done at the earliest after placing the order.

d. Installation has to be done within one week of delivery.

e. The bidder must furnish

i) Trade License Certificate
ii) GST Certificate
iii) IT return Certificate
iv) Copies of Installation and Warranty Certificates
v) Photo Copy of PAN
vi) Copies of All Kind of Govt. Taxes