



# KAZI NAZRUL UNIVERSITY

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## NOTICE INVITING e-Tender

Tender ID showing at <http://wbtenders.gov.in> :

Tender Ref. No.: KNU/R/NIT-01(e)/750/2016-17

Dated: 25.10.2016

KAZI NAZRUL University (KNU) intends to procure Instruments for Physics Department at Asansol through Online eTender. The tentative quantity of the required items along with technical configuration of each items are mentioned at Annexures separately. KNU is looking for interested bidders who have experience in supplying of above type of instruments and may follow the instructions as given below for submission of their tenders under online mode:

Items Specification



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Sl. No.	INSTRUMENT NAME	SPECIFICATION	Quantity
1.	MEASUREMENT OF DIELECTRIC CONSTANT (with temperature variation)	<p><b>1. Probes Arrangement:</b> It has two individually spring loaded probes. The probes arrangement is mounted in a suitable stand of high quality alumina which also holds the sample plate. To ensure the correct measurement of sample temperature, the thermocouple junction 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.</p> <p><b>2. Sample :</b> Modified Lead Titanate (test Sample).</p> <p><b>3. Oven :</b> This is a high quality temperature controller oven. The heating element used is a high grade Kanthal-D. It is mounted on a custom made grooved, sintered alumina fixture to avoid any slippage of heating wire. Heat shield is also provided to reduce the excessive heating of outer cover. Further the top portion is also suitably covered to meet the safety standard. The oven has been designed for fast heating and cooling rates, which enhances the effectiveness of the controller.</p> <p><b>4. Main Units :</b> The set up consists of two units housed in the same cabinet.</p> <p>i) Temperature controller: It is a high quality PID controller where the temperatures can be set and controlled easily. P, I, D can be adjusted by the user and can also be kept on Auto-tuning.</p> <p>ii) Digital Capacitance Meter: It is a handheld instrument, mounted in a cabinet for convenience. It is applied with CMOS double bevel A/D convertor that is automatic in zeroing and polar selection.</p> <p><b>Features</b></p> <ul style="list-style-type: none"> <li>☑ LCD Display</li> <li>☑ Data - Hold Switch (HOLD)</li> <li>☑ Cx+, Cx- Input Jack</li> <li>☑ Back Light Button Switch</li> <li>☑ Rotary Switch: Use this switch to select functions and ranges</li> <li>☑ Wide measuring range, covering 9 measuring sections from 0.1pf to 20,000 <math>\mu</math>F that includes nominal value of any capacitance</li> <li>☑ Power: One 9V laminated battery</li> </ul>	2
2.	ZEEMAN EFFECT EXPERIMENT	<ol style="list-style-type: none"> <li>1. High Resolution Fabry Perot Etalon</li> <li>2. Mercury Discharge Tube, (Low Pressure Mercury Discharge Tube)</li> <li>3. Power Supply (High Voltage Power Supply for Discharge Tube)</li> <li>4. Narrow Band Interference Filter, <ul style="list-style-type: none"> <li>➤ Central Wave Length : 546 nm</li> <li>➤ <math>T_{max}</math>: 74 %</li> <li>➤ HBW : 8 nm</li> </ul> </li> <li>5. Polarizer with lens</li> <li>6. Optical Bench:</li> <li>7. CCD Camera : (High Resolution CCD Camera)</li> <li>8. Telescope with Focusing Lens :</li> <li>9. Monitor 14" : TV-14</li> <li>10. Electromagnet <ul style="list-style-type: none"> <li>➤ Pole Pieces : <math>\Phi</math> 50mm diameter to 25mm</li> <li>➤ Field : 9.5 KG, at 10mm air gap</li> <li>➤ Energising Coils : Two, each with a resistance of about 3 <math>\Omega</math></li> <li>➤ Power Requirement : 0-30V dc, 4A, if coils are connected in series</li> <li>➤ Constant Current Power Supply,</li> <li>➤ Current : 0-4A</li> </ul> </li> </ol>	1



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		<ul style="list-style-type: none"> <li>➤ Line Regulation : <math>\pm 0.1\%</math> for 10 % mains charges</li> <li>➤ Load Regulation : <math>\pm 0.1\%</math> for no load to full load</li> <li>➤ Display : 3 ½ digit, 7 – segment LED display</li> <li>➤ Digital Gaussmeter ,</li> <li>➤ Range : 0-200G, 0-2KG, 0-20 KG and 0-40 KG</li> <li>➤ Accuracy : <math>\pm 0.5\%</math></li> <li>➤ Resolution : 0.1 gauss at 200G range</li> <li>➤ Display : 3 ½ digit, 7 – segment LED display with auto polarity and overflow indication</li> <li>➤ Transducer : Hall probe (InAs)</li> <li>➤ Special Feature : Indicates the direction of magnetic field</li> </ul>	
3.	Electron-Beam Evaporation System	<p>The system should be a multiple source Evaporation unit where metals like Fe, Co, Au, Al, etc. and organic substances like TCNE, FePC, P3HT, BCP, NTCDA, PTCBI, etc. could be deposited. The Unit should comprise of Vacuum chamber, Pumping system, Evaporation sources, Controls and instrumentation etc. The unit should capable of achieving an ultimate vacuum of <math>1 \times 10^{-7}</math> mbar in clean empty condition.</p> <p><b>Specifications –</b></p> <p><b>* Vacuum Chamber :</b> This should be a D-shaped Box-type Chamber made of SS 304L series stainless steel with UHV consideration in design and fabrication to achieve ultra-clean vacuum and better quality films and having internal dimensions 400mm x 400mm x 525mm(Height) with front opening hinged door. The front door should be provided with a view port for viewing the evaporation process. At the back of the chamber there should be one 6" CF-F port for connecting the pumping system. The bottom plate of the chamber should be provided with necessary CF ports for fixing the LTEs and the shutters. The EB gun should be directly mounted inside the chamber with its electrical and water feedthroughs coming through the ports provided in the bottom plate. The Substrate Holder with the rotation mechanism should be assembled on an 8" CF flange and should be mounted from the top port provided for the purpose. Additional 4 Nos. of CF-F 35 Ports should also be provided for connecting the gauges, etc. The chamber should be bakeable upto <math>250^{\circ}</math> C to achieve vacuum better than <math>10^{-7}</math> mbar. All CF ports should be provided with OFHC copper gaskets and the door gasket should be of Viton.</p> <p><b>* Pumping System:</b> The Chamber is pumped by a Turbo pumping system comprising of a Turbo molecular Pump, Rotary vacuum pump, valves etc.</p> <p><b>* Turbo Molecular Pump:</b> A Turbo molecular Pump with a pumping speed of 700 ltr./sec is provided for evacuation of the beljar.</p> <p><b>* Rotary Vacuum Pump:</b> This is direct driven double stage oil sealed rotary vane vacuum pump. Pumping Speed : 350 LPM. Ultimate Vacuum : <math>1 \times 10^{-3}</math> mbar on the pump mouth. Oil Charge : 2 litres of MD oil. Motor : 0.75 HP Pump Rotational speed : 1440 RPM</p> <p><b>*Valves &amp; Pipelines:</b> A Manually operated Gate valve with port size of 6" is provided as a High vacuum isolation valve. 1" Manually operated gate valves- 2 Nos are provided, one for backing the TMP and the other for roughing the chamber.</p>	1





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		<p><b>h. Film acoustic impedance</b> :5.000 to 99.99 <math>\times 10^{-5}</math> gm/cm sec.</p> <p><b>i. Shutter control</b> : Dedicated relay.</p> <p><b>j. Thickness set point</b> : 0.000 to 990.9% KAng. shutter relay closed when displayed thickness equals or exceed set point.</p> <p><b>k. Start Control</b> : Zero thickness and open shutter relay</p> <p><b>l. Stop Control</b> : Zero thickness and close shutter relay</p> <p><b>m. Shutter position indicator</b> : LED 'ON' indicates shutter relay activated.</p> <p><b>n. Crystal compatibility</b> : 5 or 6 MHz, jumper, jumper selectable.</p> <p><b>o. Crystal Holder</b> : Water cooled.</p> <p><b>p. Crystal health</b> : % of crystal life remaining 0% of life referenced to a film thickness of 925K.A of Aluminium.</p> <p><b>q. Crystal Frequency</b> : 5 or 6 MHz. (Selectable)</p> <p><b>r. Output control</b> : Rate of thickness select. Full scale and zero scale O/P useful in calibration recording equipment.</p> <p><b>s. Self test</b> : Automatic detection and indication of oscillator failure, powerline failure, internal failure</p> <p><b>t. Power requirement</b> : 230 V AC, 50 Hz, 5 Amps</p> <p><b>Vacuum Measuring Gauges:</b> Digital Pirani gauge with two sensors should be provided for independently monitoring / measuring the roughing and backing pressures. Pirani gauge would range from 1000 mbar to 0.001 mbar. One Digital Penning gauge with one sensor, working on cold cathode ionization principle should be provided to monitor the vacuum from <math>10^{-3}</math> mbar to <math>10^{-10}</math> mbar.</p> <p><b>Mounting Frame:</b> An aesthetic and compact powder coated MS Frame for housing all the above components like Beljar with Gadgets, Pumps, Valves, components etc. should be provided. A control panel should be provided and is part of the mounting frame, housing ON/OFF switches with indicator lamps for Mains, Rotary Pump, Diffusion Pump. All the respective components should be wired internally with interlocks and only a mains power cable with plug is taken out. The system should be wired to operate on 230V AC, 50Hz, and single phase power supply. A Power cable of 05 meters long should be provided for the mains supply. The Total unit should be provided with a Castor Wheels for movement and easy manoeuvrability.</p>	
4.	e/m EXPERIMENTAL SET UP	<p>e/m experiment is based on Thomson's method. The e/m is bulb like and contains a filament, a cathode a grid, a pair of detection plates and an anode. The tube is filled with helium at very low pressure. Some of electrons emitted by the cathode collide with helium atoms which is get excited and radiate visible light. The electron beam thus leaves a visible track in the tube and all manipulations on it can be seen. The tube is placed between a pair of fixed Helmholtz coils which produce a uniform and known magnetic field. The socket of the tube can be rotated so that the electron beam is at right angles to the magnetic field. The beam is deflected in a circular path of radius depending on the accelerating potential, the magnetic field and the charge to mass ratio e/m. This set-up can also be used to study the electron beam deflection for different directions of the magnetic field by varying the orientation of e/m tube.</p>	2
5.	FRANCK-HERTZ EXPERIMENT	<p>The experimental set up consists of</p> <ol style="list-style-type: none"> <li>1. Argon filled tetrode</li> <li>2. Filament Power Supply (3.6 – 4.3 V continuously variable)</li> <li>3. Power Supply for <math>V_{G1k}</math> (1.3 - 5 V continuously variable )</li> <li>4. Power Supply for <math>V_{G2A}</math> (1.3 - 5 V continuously variable )</li> <li>5. Power Supply for <math>V_{G2k}</math> (0 - 95 V continuously variable )</li> <li>6. Saw tooth waveform for CRO display</li> </ol>	2



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		<ul style="list-style-type: none"> <li>➤ Scanning Voltage : 0-80V</li> <li>➤ Scanning Frequency : 115±20Hz</li> </ul> <p>7. Multirange Digital Ammeter</p> <ul style="list-style-type: none"> <li>➤ Display : 3 ½ digit, LED</li> <li>➤ Range : 10<sup>-7</sup>, 10<sup>-8</sup> &amp; 10<sup>-9</sup> A</li> </ul> <p>8. Oscilloscope</p>	
6.	FOUR PROBE EXPERIMENTAL SET UP	<p>Four Probe Set-Up for Measuring the Resistivity of Very Low to Highly Resistive Samples at Different Temperature</p> <p>The experimental set up consists of:</p> <ol style="list-style-type: none"> <li>1. Probes Arrangement [holding the sample plate and RTD (A class) sensor]</li> <li>2. PID Controlled Oven (Temperature range : Ambient to 200<sup>0</sup>C; Resolution : 0.1<sup>0</sup>C; )</li> <li>3. Constant Current Source             <ol style="list-style-type: none"> <li>a) Constant Current Source, (for low resistivity to medium resistivity samples) [Open circuit voltage : 12 V; Current Range : 0 to 20 mA and 0 to 200 mA continuously variable]</li> <li>b) Low Current Source, (for high resistivity samples) [Open circuit voltage : 15 V; Current Range : 0 to 2μA, 0 to 20 μA, 0 to 200 μA and 0 to 2 mA continuously variable]</li> </ol> </li> <li>4. D.C. Microvoltmeter</li> </ol>	2
7.	MAGNETORESISTANCE SET UP	<p><b>Description of the experimental setup</b></p> <ol style="list-style-type: none"> <li>1. Four Probe Arrangement : It consists of four collinear, equally spaced (2mm) and individually spring loaded probes mounted on a PCB strip. Two outer probes are for supplying the constant current to the sample and two inner probes are for measuring the voltage developed across these probes. These eliminate the error due to contact resistance which is particularly serious in semiconductors. A platform is also provided for placing the sample and mounting four probes on it.</li> <li>2. MR - sample : Ge Crystal (n-type) dimensions : 10×10×0.5mm<sup>3</sup></li> <li>3. Magnetoresistance set up: This unit consists of a digital millivoltmeter and constant current power supply. The voltage and probe current can be read on the same digital panel meter through a selector switch.             <ol style="list-style-type: none"> <li>i) Digital Millivoltmeter                 <ul style="list-style-type: none"> <li>➤ Range : 0-200 mv, 0-2 V (100 μV min.)</li> <li>➤ Accuracy : ±0.1% ( ±1 digit)</li> </ul> </li> <li>ii) Constant Current Generator                 <ul style="list-style-type: none"> <li>➤ Open Circuit : 18 V</li> <li>➤ Current : 0 – 20mA (10 μA min.)</li> <li>➤ Accuracy : ±2% of the reading ±1 digit</li> <li>➤ Load Regulation : ±0.1% for 0 to full load</li> <li>➤ Line Regulation : ±0.2% for 10 % variation</li> </ul> </li> </ol> </li> <li>4. Electromagnet,             <ul style="list-style-type: none"> <li>➤ Pole Pieces : Φ50mm diameter flat</li> <li>➤ Field : 7.5 KG, at 10mm air gap</li> <li>➤ Energising Coils : Two, each with a resistance of about 3 Ω</li> <li>➤ Power Requirement : 0-30V dc, 4A, if coils are connected in series</li> </ul> </li> <li>5. Constant Current Power Supply,             <ul style="list-style-type: none"> <li>➤ Current : 0-4A</li> <li>➤ Line Regulation : ± 0.1% for 10 % mains changes</li> <li>➤ Load Regulation : ±0.1% for no load to full load</li> <li>➤ Display : 3 ½ digit, 7 – segment LED display</li> </ul> </li> </ol>	2



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		<p>6. Digital Gaussmeter,</p> <ul style="list-style-type: none"> <li>➤ Range : 0-2 KG, 0-20KG</li> <li>➤ Accuracy : <math>\pm 0.5\%</math></li> <li>➤ Display : 3 ½ digit, 7 – segment LED display with auto polarity and overflow indication</li> <li>➤ Transducer : Hall probe (InAs)</li> <li>➤ Special Feature : Indicates the direction of magnetic field.</li> </ul>	
8.	TWO PROBE SET UP	<p><b>Description of the experimental setup :</b></p> <ol style="list-style-type: none"> <li>1. Two probe arrangement: It has two individually spring loaded probes. The probes arrangement is mounted in a suitable stand of high quality alumina which also holds the sample plate. To ensure the correct measurement of sample temperature, the thermocouple junction is embedded in the sample plate just below the sample the sample. This stand also serves as the lid of temperature controlled oven. Proper leads are provided for connection two to capacitance meter and Temperature Controller.</li> <li>2. High temperature oven : This is a high quality temperature controlled oven. The heating element used is a high grade Kanthal – D. It is mounted on a custom made grooved , sintered alumina fixture to avoid a slippage of heating wire. Heat shield is also provided to reduce the excessive heating of outer cover. Further the top portion is also suitably covered to meet the safety standard. The oven has been designed for fast heating and cooling rates, which enhances the effectiveness of the controller.</li> <li>3. PID temperature controller : It is a high quality PID controller where the temperatures can be set and controlled easily. P, I , D can be adjusted by the user <ul style="list-style-type: none"> <li>➤ Temperature range : Ambient to 600°C</li> <li>➤ Display method : 7 segment LED display</li> <li>➤ Input sensor : Thermocouple (Chromel – Alumel)</li> <li>➤ Controlled method : PID , ON-OFF controlled, P,PI,PD, PIDF, PIDS,</li> <li>➤ Display accuracy : <math>\pm 3\%</math></li> <li>➤ Setting type : setting by front push buttons</li> </ul> </li> <li>4. <b>High Voltage Power Supply</b> <ul style="list-style-type: none"> <li>➤ Polarity : + ve or –ve , as required</li> <li>➤ Range ; 0-200V &amp; 0-1500V continuously adjustable</li> <li>➤ Max. Current : 1mA</li> <li>➤ Stability : <math>\pm 0.05\%</math> for <math>\pm 10\%</math> mains variation</li> <li>➤ Regulation : <math>\pm 0.05\%</math> for 0 to 1mA load</li> <li>➤ Display : 3 ½ digit, 7 – segment LED</li> </ul> </li> <li>5. <b>Digital Picoammeter</b> <ul style="list-style-type: none"> <li>➤ Current Range : 1nA to 100<math>\mu</math>A full scale in 6 decade ranges with 100% over ranging (1pA minimum)</li> <li>➤ Display : 3 ½ digit, 7 – segment LED display</li> <li>➤ Accuracy : <math>\pm 0.2\%</math> for all ranges</li> </ul> </li> </ol>	
9.	ELECTRONS SPIN RESONANCE SPECTROMETER	<ol style="list-style-type: none"> <li>1. Helmholtz coils</li> <li>2. ESR Sample: DPPH</li> <li>3. Built – in digital frequency meter</li> <li>4. Helmholtz coil current display.</li> <li>5. R.F. Oscillator</li> <li>6. Detector.</li> <li>7. AF amplifier</li> <li>8. 50 Hz phase shifter.</li> <li>9. 50 Hz sweep unit.</li> </ol>	2
10	HALL EFFECT	<ol style="list-style-type: none"> <li>1. <b>Hall probes :</b></li> </ol>	2



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	EXPERIMENT	<p>Hall probe (Ge Crystal)</p> <ul style="list-style-type: none"> <li>➤ Material : Ge single crystal n or p – type</li> <li>➤ Resistivity : 8-10 <math>\Omega</math> cm</li> <li>➤ Contacts : spring type (solid silver)</li> <li>➤ Zero field potential : &lt; 1mV (adjustable)</li> <li>➤ Hall Voltage : 35 – 60 mV/10mA/KG</li> </ul> <p><b>2. Hall effect set-up, consisting following :</b></p> <p>i) <i>Digital Millivoltmeter</i></p> <ul style="list-style-type: none"> <li>➤ Range : 0 – 200mV (resolution 100 <math>\mu</math>V)</li> <li>➤ Accuracy : <math>\pm 0.1</math> % of reading <math>\pm 1</math> digit</li> <li>➤ 1 Impedance : 1Mohm</li> <li>➤ Display : <math>3\frac{1}{2}</math> digit, 7 segment LED</li> </ul> <p>ii) <i>Constant current generator</i></p> <ul style="list-style-type: none"> <li>➤ Currents : 0 – 20 mA (Resolution 10 <math>\mu</math>A)</li> <li>➤ Display : <math>3\frac{1}{2}</math> Digit, 7 segment LED</li> <li>➤ Accuracy : 0.25 %; <math>\pm 1</math> Digit</li> <li>➤ Load Regulation : 0.05 % for on load to full load</li> <li>➤ Line Regulation : 0.05% for <math>\pm 10\%</math> changes</li> </ul> <p><b>3. Electromagnet :</b></p> <ul style="list-style-type: none"> <li>➤ Pole pieces : <math>\Phi 50</math>mm diameter flat</li> <li>➤ Field : 7.5 KG, at 10 mm air gap</li> <li>➤ Energising Coils : Two each with a resistance of about 3<math>\Omega</math></li> <li>➤ Power Requirement : 0- 30 V dc, 4A, if coils are connected in series.</li> </ul> <p><b>4. Constant Current Power Supply :</b></p> <ul style="list-style-type: none"> <li>➤ Current : 0-4A</li> <li>➤ Line Regulation : <math>\pm 0.1\%</math> for 10 % mains charges</li> <li>➤ Load Regulation : <math>\pm 0.1\%</math> for no load to full load</li> <li>➤ Display : <math>3\frac{1}{2}</math> digit, 7 – segment LED display</li> </ul> <p><b>5. Digital Gauss Meter :</b></p> <p>a) Digital Gaussmeter, - Magnetic field measurement, Excellent Linearity, IC controlled circuit</p> <ul style="list-style-type: none"> <li>➤ Application : Suitable for the measurement of magnetic field from 1 gauss to 20 KG</li> <li>➤ Range : 0-2KG, 0-20 KG</li> <li>➤ Accuracy : <math>\pm 0.5</math> %</li> <li>➤ Display : <math>3\frac{1}{2}</math> digit, 7 segment LED display</li> <li>➤ Transducer : Hall Probe(InAs)</li> <li>➤ Special Feature : Indicates the direction of the magnetic field</li> </ul> <p><b>6. Hall probe stand : 2 pieces</b></p>	
11	STUDY OF P-N JUNCTIONS	<p>Experimental Determination of :</p> <ul style="list-style-type: none"> <li>• Reverse saturation current <math>I_0</math> and material constant</li> <li>• Temperature coefficient of junction voltage <math>dV/dt</math></li> <li>• Energy band-gap <math>V_{G0}</math></li> <li>• Junction capacitance</li> </ul> <p>1. Study kit for PN junctions</p> <ul style="list-style-type: none"> <li>➤ <math>3\frac{1}{2}</math> digit, DPN for current / temperature measurement</li> <li>➤ <math>3\frac{1}{2}</math> digit, DPM for bias voltage / junction voltage measurements.</li> <li>➤ Two fixed frequency oscillator ( 5 kHz – 20kHz) with the same output (20mV)</li> </ul> <p>2. Temperature controlled oven with sensor</p> <p>3. PNJ sample</p>	2





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		4. CRO	
12	STUDY OF A TRANSISTOR AMPLIFIER (RC COUPLED) CUM FEED – BACK AMPLIFIER	<ol style="list-style-type: none"> <li>1. Study of the basic circuit of a RC Coupled amplifier</li> <li>2. Frequency response of RC Coupled amplifier</li> <li>3. Effect of negative feedback on the gain and frequency response of the amplifier</li> <li>4. Effect of positive feedback on the gain and frequency response of the amplifier</li> <li>5. Verification of the condition of oscillation</li> <li>6. Study of different classes of amplifier</li> </ol> <p><b>Accessories required</b></p> <ol style="list-style-type: none"> <li>1. Function generator - Square, sine and triangular output up to 2 MHz, high stability, low distortion Amplitude : 0-15 volt (p - p) Output impedance : 50 <math>\Omega</math></li> <li>2. CRO – 30 MHz dual trace</li> </ol>	4
13	STUDY OF A MODULATION AND DEMODULATION WITH BUILT IN CARRIER FREQUENCY SOURCE	<p>The set-up consists of modulating and demodulating circuits. It is provided with a fixed frequency (70KHz) oscillator, which may be used for carrier frequency. This eliminates the need of a R.F. Oscillator. The carrier signal may be given from any other oscillator also, if the change in carrier frequency is desired. Since the circuit is designed for comparatively low frequency (70KHz to 150KHz) carrier signal, the usual Oscilloscope is good enough.</p> <p>The following studies can be carried out with this set-up :</p> <ol style="list-style-type: none"> <li>1. Carrier signal testing</li> <li>2. Variation of modulated wave with the modulation signal</li> <li>3. Study of detector circuit</li> </ol> <p>The experimental set-up is provided with a built-in power supply. Measuring/Testing instruments required A.F. Oscillator</p>	4
14	STUDY OF BASIC OPERATIONAL AMPLIFIER	<p>The experimental set-up on the study of Op. Amp. consists of a 741 IC with facilities for convenient connections, two regulated power supplies (<math>\pm 12V</math>), a variable voltage source and a multirange digital voltmeter with 3½ digit LED display.</p> <p>The resistances (0.1% metal film) required are mounted on the board separately, which may be connected as and when required through patch chords. The student can also connect external components, if required.</p> <p>The following studies can be carried out</p> <ol style="list-style-type: none"> <li>1. Working of the basic circuit</li> <li>2. Measurement of bias and offset currents</li> <li>3. Study of inverting and non-inverting amplifier configurations</li> <li>4. Introduction to amplifier drift</li> </ol>	4
15	STUDY OF ASTABLE AND MONOSTABLE MULTIVIBRATOR	<p>The set-up consists of 555 IC with facilities for convenient connection at the board, a power supply, built-in facilities for various type of triggers-variable frequency, variable voltage, and manual. The resistors and capacitors required are mounted on the board.</p> <p><b>The following studies can be carried out</b></p> <ol style="list-style-type: none"> <li>1. Operation as a free running multivibrator</li> <li>2. Operation as a monostablemultivibrator</li> <li>3. Operation as a preset time delay</li> </ol>	4
16	STUDY OF AN INTEGRATED CIRCUIT REGULATOR	<p>The experimental set-up consists of an IC 723 with facilities for convenient connections, an unregulated power supply, voltmeter, an ammeter and all the other components - resistances, potentiometers, variable load etc. required to perform the experiments.</p>	4



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		The following studies can be carried out : 1. Working as a voltage regulator 2. Working as a current regulator							
17	HELIUM NEON LASER BASIC SET-UP	<ol style="list-style-type: none"> <li>1. He Ne Laser high voltage supply and controller</li> <li>2. Main laser tube with XY- adjustment</li> <li>3. Module D laser Mirror adjustment holder left with ½" mount</li> <li>4. Laser Mirror - ½", R=700mm, HR@ 632nm</li> <li>5. Module D laser Mirror adjustment holder right with ½ " mount</li> <li>6. Laser Mirror - ½ ", flat, HR@ 632nm</li> <li>7. Mounting Plate, including carrier 20mm, C 25</li> <li>8. Module G- Si PIN photodetector</li> <li>9. Digital multimeter 3 ½ digits</li> <li>10. Adjustment holder, 4 axes, carrier 20 mm</li> <li>11. Pilot laser DIMO 532nm</li> <li>12. Optical rail MG-65, 1000m</li> <li>13. Littrow prism with adjustment holder – The Littrow prism is a combined optical component consisting of a coated prism. It acts as laser mirror and selective element simultaneously. A high quality BK7 Littrow prism is supplied with a high reflectivity (&gt; 99.98%) coating in the range from 580 to 650 nm.</li> <li>14. Single mode etalon with adjustment holder – A glass body with parallel faces is mounted into 4 axis adjustment holder which is placed inside the cavity. By tilting the etalon multiple order of the tuner are demonstrated. To verify the single mode operation either an optical spectrum analyzer (part of XP-03) or an electronic one is needed.</li> <li>15. Birefringent tuner (Lyot filter) with adjustment holder – A plate of natural birefringent quartz is mounted in an rotator which allows the turning of the plate for tuning different lines of the main laser. With an additional rotator the plate can be tuned precisely to the Brewster's angle resulting in lowest reflection losses.</li> <li>16. BNC/Banana connection leads 1m</li> <li>17. Optical cleaning set</li> <li>18. Manual HeNe Laser.</li> </ol>	1						
18	Measurement of velocity of Sound by ultrasonic interferometer	<p><b>The Ultrasonic Interferometer consists of the following parts:</b></p> <table border="1"> <tr> <td>HIGH FREQUENCY GENERATOR</td> <td>Single and Multi-frequency</td> </tr> <tr> <td>MEASURING CELL</td> <td>Max. displacement of the reflector : 20 mm Required Quantity of liquid: 10 c.c. Least Count of micrometer: 0.01mm/0.001 mm</td> </tr> <tr> <td>SHIELDED CABLE</td> <td>Impedance : 50 Ω</td> </tr> </table>	HIGH FREQUENCY GENERATOR	Single and Multi-frequency	MEASURING CELL	Max. displacement of the reflector : 20 mm Required Quantity of liquid: 10 c.c. Least Count of micrometer: 0.01mm/0.001 mm	SHIELDED CABLE	Impedance : 50 Ω	2
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SHIELDED CABLE	Impedance : 50 Ω								
19	J-K Master Slave Flip-Flop	<p><b>Features :</b></p> <ol style="list-style-type: none"> <li>1. The schematic circuit diagram printed on P.C. B. for all terminals, switches, components and power supplies.</li> <li>2. All ICs provided on sockets and possible to replace without opening the trainer board.</li> <li>3. All ICs are visible from top and the pin extensions are available around ICs with diagrams.</li> <li>4. All terminals (2 mm sockets) soldered properly to avoid loose connections.</li> </ol>	4						



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		<b>Specification :</b> 1. Power supply requirement : 230V AC, 50 Hz. 2. Built in IC based regulated Power supply : +5 V DC/200 mA. 3. Following parts provided on Single PCB with connecting terminals. JK MS FLIP FLOP - IC 7476, and IC 7410 4. High /Low switches : 6 Nos provided to apply 0 and 1 level 5. Logic output Indicators : 4 LEDs provided for output level indication. 6. Pulsar Switches : 1 No provided.	
20	Frequency response characteristics of an inverting operational amplifier	Complete with IC regulated power supply, Function generator with variable amplitude and frequency and frequency counter, bread board with components, Dual trace oscilloscope.	4
21	Frequency response characteristics of a LC filter circuit	Different type of LC filter circuit, Passive and active, Function generator with variable amplitude and frequency and frequency counter, bread board with components, Dual trace oscilloscope	4
22	Faraday effect (measurement of Verdant Constant)	The set up consists of the following : <b>Optical Rail</b> Length : 1000 mm Material : Black anodized, <b>Kinematic Laser Mount</b> Material : Black anodized Aluminium alloy Adjustments : Using 80 tpi lead screws Adjustment Range : +/-4 degrees <b>Polarizer Rotator with Mount</b> Material : Sheet Polarizer Rotation : 360 degree Resolution : 1 degree <b>Polarizer with Precision Rotation</b> Material : Sheet Polarizer Rotation : 360 degree Fine Rotation : 15 degree Resolution : 0.1 degree <b>Detector Mount with X- Translation</b> Material : Black anodized Aluminium alloy Travel : Micrometer controlled	1



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		<p>Resolution : 0.01mm</p> <p><b>Electromagnet with Mount</b></p> <p>Winding Material : Copper</p> <p>Number of turns : 2508</p> <p>Length of coil : 150 mm</p> <p><b>Glass Rod Specimen</b></p> <p>Material : SF – 10</p> <p>Length : 10 cm</p> <p>Diameter : 6 mm</p> <p><b>Constant Current Power supply</b></p> <p>Input : 230V 50 Hz</p> <p>Output Current : 0 - 4 Amps</p> <p><b>Diode Laser with Power supply (Red)</b></p> <p>Wave length : 650 nm</p> <p>Optical power : 3 mW</p> <p><b>Diode Laser with Power supply (Green)</b></p> <p>Wave length : 532 nm</p> <p>Optical power : 5 mW</p> <p><b>Detector Output Measurement Unit</b></p> <p>Sensor Type : Photo Transistor</p> <p>Display : 7 segment, 3 ½ digit</p> <p>Range : 0 - 199 milli /micro amperes</p>	
23	Pockel effect	<p>The set up consists of the following</p> <p><b>Optical Rail</b></p> <p>Length : 1000 mm</p> <p>Material : Black anodized,</p> <p><b>Polarizer Rotator with Mount :</b></p> <p>Material : Sheet Polarizer</p> <p>Rotation : 360 degree</p> <p>Resolution : 1degree</p> <p><b>Polarizer with Precision Rotation</b></p> <p>Material : Sheet Polarizer</p> <p>Rotation : 360 degree</p> <p>Fine Rotation : 15 degree</p> <p>Resolution : 0.1 degree</p> <p><b>Detector Mount with X-Translation</b></p>	1



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		<p>Material : Black anodized Aluminum alloy Travel : Micrometer controlled</p> <p>Resolution : 0.01mm</p> <p><b>Pockel Cell with Mount</b> Electrode Material : Copper Cavity width : 0 - 6 mm Lead screw control Cavity size : 30 X 5 X 5 m</p> <p><b>Electro-Optic Crystal</b> Material : Lithium Niobate (LiNbO<sub>3</sub>) Dimension : 25 X 4 X 4 mm</p> <p>High Voltage Power Supply Input : 230 V 50 Hz Voltage : 0 - 2 KV</p> <p><b>Diode Laser with Power supply (Red)</b> Wave length : 650 nm Optical power : 3 Mw</p> <p><b>Detector Output Measurement Unit</b> Sensor Type : Photo Transistor</p> <p>Display : 7 segment, 3 ½ digit Range : 0 - 199 milli /micro amperes</p>	
24	(a) Laser optics Lab (b) 4 nos spare able source with detector (c) 4 more optical board with table	<p>Optical bread board with rigid support (800 mm X 600 mm), Laser fiber coupler Diode laser with supply (5 mW, Michelson type), Fiber chuck holder diode laser with supply (MW, 530nm Michelson type), Bending Loss Apparatus Diode laser with supply (3mW, 650nm without lens), photo transistor with cell, photo diode with cell Laser mount, LDR with cell Beam splitter with mount.</p> <p>Mirror mount with precision translation stage, optocouper with cell mirror mount with translation stage, solar cell with mounted mirror (2No.) Optoelectronics measurement unit on stage polarizer rotator Glass slides polarizer Analyzer Diffraction slits with Box.</p> <p>Colour filter meter scale with stand PMMA road with stand Small particles (Bottle) Water tank CD Cell mount XYZ translation stage with detector mounting Screw O/P measurement unit Dust protective cover, user Manual.</p>	2
25	Digital Multimeter	<p><b>4½ Digit True RMS Digital Multimeter</b> ◆ 19999 Counts 4½ Digit 40 mm High Characters Jumbo LCD Display ◆ Dual Slope Integration A/D Converter System ◆ Basic DC Voltage Accuracy of ±0.05%</p>	5



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		<ul style="list-style-type: none"> <li>◆ True RMS AC Measurement</li> <li>◆ Capacitance Measurement</li> <li>◆ All Ranges are Fully Overload Protected</li> <li>◆ Frequency Measurement upto 200KHz</li> <li>◆ Diode Testing</li> <li>◆ Continuity Testing (Buzzer)</li> <li>◆ Automatic Polarity Indication</li> <li>◆ hfe Testing</li> </ul>	
26	CE amplifier characteristics (CE mode)	Complete with DC regulated power supply, CE amplifier mechanism, Function generator, CRO etc.	4
27	LDR characteristics	LDR is mounted on rail and can be moved with respect to variable light source. The kit complete with variable and fixed voltage source, digital meters and light intensity meter.	4
28	Quinck's tube method	<p>The apparatus consists of U-shaped tube known as Quinck's tube. One of the limb of the tube is wide and the other one narrow. The experimental liquid or solution is filled in the tube and is placed in such a way that the meniscus of the liquid in narrow limb is at the centre of the magnetic field.</p> <p>The level of the liquid in the narrow tube is read by a travelling microscope when magnetic field is off. The magnetic field is switched on and the new raised level of the column is again read with the travelling microscope.</p> <p>The apparatus consists of the following:</p> <p>Quinck's tube with stand Sample: FeCl<sub>3</sub> Electromagnet – Tapper pole pieces Constant Current Power Supply – 0 to 5 amp with digital display Digital Gaussmeter – Up to 20 KG Travelling Microscope</p>	1
29	Planck's Constant Experiment	<p><b>THE APPARATUS CONSIST OF THE FOLLOWING :</b></p> <ol style="list-style-type: none"> <li>1. Photo Sensitive Device : Vacuum photo tube.</li> <li>2. Light source : Halogen tungsten lamp 12V/35W.</li> <li>3. Colour Filters : 635 nm, 570 nm, 540 nm, 500 nm &amp; 460 nm.</li> <li>4. Accelerating Voltage : Regulated Voltage Power Supply [Output : ± 15 V continuously variable; Accuracy : ± 0.2 %]</li> <li>5. Current Detecting Unit : Digital Nanoammeter.</li> </ol> <p>Range : 1000 μA, 100 μA, 10 μA &amp; 1μA with 100 % over ranging facility</p> <p>Resolution : 1 nA at 1 μA range</p> <p>Display : 3½ digit 7-segment LED</p> <p>Accuracy : ± 0.2%</p> <ol style="list-style-type: none"> <li>6. Power Requirement : 220V ± 10 %, 50 Hz.</li> <li>7. 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</li> </ol>	2



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		provided to install colour filter, a focus lens is fixed in the back end.																			
30	Digital Microvoltmeter	<p><b>Features:</b> Very low temperature drift Low dc input bias current - 10pA Measures voltage down to 1<math>\mu</math>V Automatic polarity indication Recorder facility (optional)</p> <p><b>Specifications:</b></p> <table border="1"> <tr> <td>Range</td> <td>1mV, 10mV, 100mV, 1V &amp; 10V with 100% over-ranging.</td> </tr> <tr> <td>Resolution</td> <td>1<math>\mu</math>V</td> </tr> <tr> <td>Accuracy</td> <td><math>\pm 0.2\% \pm 1</math> digit</td> </tr> <tr> <td>Stability</td> <td>Within <math>\pm 1</math> digit</td> </tr> <tr> <td>Input Impedance</td> <td>&gt;1000 Mohm (10Mohm on 10V range)</td> </tr> <tr> <td>Display</td> <td>3½ digit, 7 segment LED with autopolarity and decimal indication</td> </tr> <tr> <td>Power Supply</td> <td>220V <math>\pm 10\%</math>, 50Hz</td> </tr> <tr> <td>Weight</td> <td>2.5Kg</td> </tr> <tr> <td>Dimensions</td> <td>245mm X 280mm X 120mm</td> </tr> </table>	Range	1mV, 10mV, 100mV, 1V & 10V with 100% over-ranging.	Resolution	1 $\mu$ V	Accuracy	$\pm 0.2\% \pm 1$ digit	Stability	Within $\pm 1$ digit	Input Impedance	>1000 Mohm (10Mohm on 10V range)	Display	3½ digit, 7 segment LED with autopolarity and decimal indication	Power Supply	220V $\pm 10\%$ , 50Hz	Weight	2.5Kg	Dimensions	245mm X 280mm X 120mm	4
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31	Digital Nanoammeter	<p><b>Specifications</b></p> <table border="1"> <tr> <td>Range</td> <td>100nA, 1mA, 10mA, 100mA with 100% over-ranging</td> </tr> <tr> <td>Accuracy</td> <td>0.2% for all ranges</td> </tr> <tr> <td>Resolution</td> <td>0.1nA</td> </tr> <tr> <td>Display</td> <td>3½ digit 7 segment LED with auto polarity and decimal indication</td> </tr> <tr> <td>Input</td> <td>Through amphenol connector</td> </tr> <tr> <td>Power Supply</td> <td>220V<math>\pm 10\%</math>, 50Hz</td> </tr> <tr> <td>Weight</td> <td>2.5Kg</td> </tr> <tr> <td>Dimensions</td> <td>240mm X 275mm X 120mm</td> </tr> </table>	Range	100nA, 1mA, 10mA, 100mA with 100% over-ranging	Accuracy	0.2% for all ranges	Resolution	0.1nA	Display	3½ digit 7 segment LED with auto polarity and decimal indication	Input	Through amphenol connector	Power Supply	220V $\pm 10\%$ , 50Hz	Weight	2.5Kg	Dimensions	240mm X 275mm X 120mm	4		
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32	High Voltage Power Supply	<p><b>Specifications</b></p> <p>Output : 0-1500V continuously adjustable</p> <p>Current : 1mA (max.)</p> <p>Polarity : +ve or -ve, as required</p>	2																		



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		<p>Regulation : <math>\pm 0.05</math> % for 0 to 1mA load</p> <p>Stabilization : <math>\pm 0.02</math> % for <math>\pm 10</math> % mains variation</p> <p>Display : <math>3\frac{1}{2}</math> digit, 7 segment LED DPM</p> <p>Connection : Output through a amphenol connector on the front panel</p> <p>Protection : Fully protected against overload and short circuit by current limiting technique</p> <p>Power requirements : 220V <math>\pm 10\%</math>, 50Hz</p> <p>Weight : 5 Kg</p> <p>Dimensions : 240 mm X 390 mm X 130 mm</p>																					
33	True RMS A.C. Millivoltmeter	<p><b>Specifications</b></p> <table border="1"> <tr> <td>Voltage Range</td> <td>20mV, 200mV, 2V and 20V</td> </tr> <tr> <td>Frequency Range</td> <td>10Hz to 200KHz</td> </tr> <tr> <td>Input Impedance</td> <td>1 M<math>\Omega</math></td> </tr> <tr> <td>Accuracy</td> <td>1% in the range 10Hz-100 KHz ; 2% in the range 100 KHz – 200 KHz</td> </tr> <tr> <td>Display</td> <td><math>3\frac{1}{2}</math> digit, 7 segment LED (12.5mm height) with decimal and overflow indication</td> </tr> <tr> <td>Power Supply</td> <td>220V <math>\pm 10\%</math>, 50Hz</td> </tr> <tr> <td>Weight</td> <td>2.5 Kg &amp; 3 Kg</td> </tr> <tr> <td>Accessories Supplied</td> <td>75 cm shielded cable with a coaxial connector at one end and banana plugs on the other end</td> </tr> <tr> <td>Oscillator Output</td> <td>0-300 mV continuously variable</td> </tr> <tr> <td>Frequency</td> <td>1KHz fixed</td> </tr> </table>	Voltage Range	20mV, 200mV, 2V and 20V	Frequency Range	10Hz to 200KHz	Input Impedance	1 M $\Omega$	Accuracy	1% in the range 10Hz-100 KHz ; 2% in the range 100 KHz – 200 KHz	Display	$3\frac{1}{2}$ digit, 7 segment LED (12.5mm height) with decimal and overflow indication	Power Supply	220V $\pm 10\%$ , 50Hz	Weight	2.5 Kg & 3 Kg	Accessories Supplied	75 cm shielded cable with a coaxial connector at one end and banana plugs on the other end	Oscillator Output	0-300 mV continuously variable	Frequency	1KHz fixed	4
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34	Electromagnet & Power Supply	<p><b>Specifications</b></p> <table border="1"> <tr> <td colspan="2">Electromagnet</td> </tr> <tr> <td>Field Intensity</td> <td>11KG at 10mm air-gap with flat pole pieces</td> </tr> <tr> <td>Pole Pieces</td> <td>75mm diameter</td> </tr> </table>	Electromagnet		Field Intensity	11KG at 10mm air-gap with flat pole pieces	Pole Pieces	75mm diameter	2														
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38	PID Controlled Oven	<p><b>Specifications :</b></p> <table border="1"> <tr> <td>Temperature Range</td> <td>Ambient to 600°C</td> </tr> <tr> <td>Power Supply</td> <td>100-240VAC; 50/60Hz</td> </tr> <tr> <td>Display Method</td> <td>7 Segment LED display [Process value (PV):Red, Set value (SV):Green]</td> </tr> <tr> <td>Input Sensor</td> <td>Thermocouple (Chromel – Alumel)</td> </tr> <tr> <td>Control Method</td> <td>PID, PIDF, PIDS</td> </tr> <tr> <td>Display Accuracy</td> <td>± 0.3%</td> </tr> <tr> <td>Setting Type</td> <td>Setting by front push buttons</td> </tr> <tr> <td>Proportional Band(P)</td> <td>0 to 100.0%</td> </tr> <tr> <td>Integral Time(I)</td> <td>0 to 3600 Sec</td> </tr> <tr> <td>Derivative</td> <td>0 to 3600 Sec</td> </tr> </table>	Temperature Range	Ambient to 600°C	Power Supply	100-240VAC; 50/60Hz	Display Method	7 Segment LED display [Process value (PV):Red, Set value (SV):Green]	Input Sensor	Thermocouple (Chromel – Alumel)	Control Method	PID, PIDF, PIDS	Display Accuracy	± 0.3%	Setting Type	Setting by front push buttons	Proportional Band(P)	0 to 100.0%	Integral Time(I)	0 to 3600 Sec	Derivative	0 to 3600 Sec	2
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39	Travelling Microscope	<b>Scale and Vernier</b> <ul style="list-style-type: none"> <li>Horizontal scale : 20cm divided at 0.5mm interval</li> <li>Vertical scale : 15cm divided at 0.5mm interval</li> <li>Vernier scale : 50 divisions with a least count of 0.01mm</li> </ul>	2														
40	Digital Microscope	<b>Features</b> <ul style="list-style-type: none"> <li>Adjustable Focus (10-60X, 230X)</li> <li>High-precisions lens</li> <li>LED illumination switchable and adjustable</li> <li>Instant snapshots and time-lapse video recording</li> <li>Support Multi languages</li> </ul> <b>Specifications</b> <ul style="list-style-type: none"> <li>Effective Pixel 320x240, 640x480 1280x1024, 1600x1200</li> <li>Resolution 1.3 Megapixel</li> <li>Image 1.4" CMOS sensor</li> <li>Signal Interface USB 2.0</li> <li>White Balance Automatic</li> <li>USB line 1.5 Meters</li> </ul> <b>System Requirement</b> <ul style="list-style-type: none"> <li>Pentium III and 256MB Ram above</li> <li>Windows XP/Vista/Windows 7</li> <li>Available USB 2.0 port</li> <li>17" PC display (Preferable)</li> <li>CD ROM Drive</li> </ul>	1														
41	Regulated Power Supply	<b>Specifications</b> <table border="1"> <tr> <td>Output voltage</td> <td>+12V, -12V, +5V, -5V fixed</td> </tr> <tr> <td>Current</td> <td>300mA (each supply)</td> </tr> <tr> <td>Line Regulation</td> <td>±0.05% for 10% variation of mains voltage</td> </tr> <tr> <td>Load Regulation</td> <td>±0.1% for 0 to full load variation</td> </tr> <tr> <td>Protection</td> <td>Thermal and over current</td> </tr> <tr> <td>Dimensions</td> <td>210mm X 180mm X 100mm</td> </tr> <tr> <td>Weight</td> <td>2.25Kg</td> </tr> </table>	Output voltage	+12V, -12V, +5V, -5V fixed	Current	300mA (each supply)	Line Regulation	±0.05% for 10% variation of mains voltage	Load Regulation	±0.1% for 0 to full load variation	Protection	Thermal and over current	Dimensions	210mm X 180mm X 100mm	Weight	2.25Kg	10
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42	Function Generator	0.3Hz to 3MHz Frequency Output in 8 Ranges ➤ Versatile Waveforms : Sine, Square, Triangle, Ramp, Pulse and DC Outputs ➤ Standard AM, Balance AM, FM, ASK, FSK, PWM Modulation and Sweep Mode ➤ Internal / External Modulation ➤ 20V p-p Output Level	10														



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		<ul style="list-style-type: none"> <li>➤ 60dB Attenuation</li> <li>➤ Variable DC Offset Control</li> <li>➤ Low Distortion for Sine Waveform 1% typically</li> <li>➤ Variable Symmetry for Generating Saw tooth and Pulse Waveforms</li> <li>➤ 4 Digits Display</li> <li>➤ Dedicated Auxiliary Function Generator upto 20 KHz</li> </ul>	
43	Spectrometer	Spectrometer (7" circle) :- Deluxe type, Verniers reading 10 sec. The objective used in telescope and collimator area chromatic and provided with rack & pinion focusing arrangement. Telescope arm and prism table are provided with fine & coarse adjustments. The prism table is provided with three levelling screw and is engraved with concentric rings and lines. The instrument is finished with prism clamping device and diffraction grating stand.	2
44	Microbalance	Dual range semi micro balance which should allow weighing at different resolutions : <b>Measuring Range</b> : From 0 - 120 grams, (Resolution ~ 0.01mg divisions); From 120 - 220 grams (Resolution ~ 0.1mg division).	1
45	Hot Plate	Digital Magnetic Stirrer Hot Plate : Top Plate Size : 18 x18 cm Top Plate Material : Acid & Alkali resistant glass Ceramic Electronic speed control : from 100-1000 RPM.	4
46	Horizontal Tube furnace	<b>Maximum temperature : 1400 deg.C</b> Tube diameter :> 8 cm. Effective Hot zone : 10 cm <b>Programmable digital temperature controller with display.</b> <b>S type thermocouple.</b>	1
47	Box furnace	Inner Dimension: 100 mm X 100 mm X 100 mm Outer dimension: approx 200 mm X 200 mm X 200 mm Effective Hot Zone: 0.5 Liter Heating element: Sic/Mosi2 Programmable PID controller with Display 6/8 segment ramp/soak S-Type thermocouple Imported Furnace insulators/ 3 layers Outer body made of M.S. with powder coating Front open door	1
48	KBr Press + one more KBr Die	Capacity: 15 Tons Piston Size : 80 mm Piston Travel : 25 mm Overall Dimensions : 230 X 180 X 400 mm Net Weight : 35 Kgs. KBr Die - 10 mm (Maximum Load Upto 6 Ton)	1
49	Source Measure Unit	<b>A. Precision Source/Measure Unit, 2ch, 100 fA resolution, 210 V, 3 A DC/10.5A pulse with 1 No. Kelvin probe set</b> <b>Instrument Should Have Following Features :</b> <ul style="list-style-type: none"> <li>• Integrated voltage/current 4-quadrant precision source and</li> <li>• measurement capabilities for easy and accurate I/V measurement</li> <li>• Wide coverage up to 210 V,3 A DC/10.5 A pulse</li> <li>• The 4.3" front panel color display supports both graphical and numerical view modes</li> <li>• High resolution arbitrary waveform generation (AWG) and list sweep</li> <li>• functions (10 μs minimum interval)</li> </ul>	1



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		<ul style="list-style-type: none"> <li>• High speed digitizing capability (maximum 100000 points/s sample rate)</li> <li>• Free application software to facilitate PC -based instrument control</li> <li>• IVI-COM drivers, and SCPI supporting conventional SMU command set for basic compatibility</li> <li>• LXI class C, USB2.0, GPIB, LAN and digital I/O interface</li> </ul> <p><b>Detail Technical Specification :</b></p> <p>a) No of Channel : 2  b) Source Voltage : <math>\pm 200</math> mV – <math>\pm 200</math> V  c) Min Resolution : 1 <math>\mu</math>V (min)  d) Source Current : <math>\pm 100</math> nA – <math>\pm 3.03</math> A  e) Source Current Resolution : <math>\pm 1</math> pA (min)  f) Current Pulsed Output : <math>\pm 10.5</math> A  g) Pulse width at DC or Pulse output : 50 <math>\mu</math>s to 99999.9 s  h) Max. Digit at Source : 5 <math>\frac{1}{2}</math> Digit  i) Voltage Measurement : <math>\pm 200</math> mV-<math>\pm 200</math> V  j) Resolution : 100 nV (min)  k) Current Measurement : <math>\pm 100</math> nA – <math>\pm 3</math> A  l) Resolution : <math>\pm 100</math> fA (min)  m) Max. Digit at Measurement : 6 <math>\frac{1}{2}</math> Digit  n) Min programmable interval for List : 20 <math>\mu</math>s sweep/ AWG waveform</p> <p><b>B.Mandatory Accessories :</b></p> <p>a) Banana - Triaxial Adapter for 2-wire (non Kelvin) connection  b) Triaxial Cable (1.5m)  c) Device/Component Test Fixture with 4 Triax Connectors</p>	
50	6 $\frac{1}{2}$ Digital Multimeter	<p><b>Technical Specifications :</b></p> <p>Digits: 6 <math>\frac{1}{2}</math></p> <p>Expansion channel: 10 DC Volts  Sensitivity: 100 nV  Maximum Reading: 1000 V  Basic Accuracy: 0.002 %  AC Volts (TRMS)  Sensitivity: 100 nV  Maximum Reading: 750 V  Basic Accuracy: 0.05 %  Bandwidth: 3 Hz – 300 kHz Ohms  Sensitivity: 100 <math>\mu\Omega</math>  Maximum Reading: 120 M<math>\Omega</math>  Basic Accuracy: 0.008 %  DC Amps  Sensitivity: 10 nA  Range Spam: 10 mA to 3 A  Basic Accuracy: 0.03 %  AC Amps (TRMS)  Sensitivity : 10<math>\mu</math>A  Range Spam : 1 A3 A  Basic Accuracy : 0.1%  Bandwidth : 3Hz5 kHz  General Features  Interface: GPIB; RS-232  Reading Memory: 1024 rgd  Maximum speed: 2000 rdg/s  Temperature Meas.: T/C  Language Emulation: 8840/42, 196/199</p>	1



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51	<p>i) Electromagnet ii) Magnet Power Supply iii) Pair of Auxiliary Coils mounted on Pole Pieces and its Power Supply to give a resolution of 1 Gauss by the field produced by laboratory electromagnet</p>	<p><b>i) FIELD INTENSITY:</b> 3500 Gauss in an air gap of 60mm with flat pole pieces. <b>POLE DIAMETER:</b> 100 mm (flat pole pieces supplied with the electromagnet). <b>AIR-GAP:</b> Continuously adjustable from 0 to 100 mm with two ways knobbed wheel screw adjusting system. <b>COIL SEPERATION:</b> 110 mm. <b>YOKE CONSTRUCTION &amp; MATERIAL:</b> 'U' shaped made out of soft iron. <b>NUMBER OF ENERGISING COILS:</b> Two, wound on non magnetic formers. <b>COOLING:</b> Water-cooled for continuous operation with a flow rate of 3 liters per minute at 20 p.s.i inlet pressure. Water cooling is not required at energizing current below 30% of full value. <b>ii) OUTPUT CURRENT :</b> 0 to 15 Amps continuously variable with Coarse and fine controls. <b>POWER OUTPUT :</b> 1000 Watts. <b>STABILITY :</b> 0.05% at a set value ( 8 hrs with constant External effects. ) <b>PROTECTION :</b> MCB and HRC fuses in the input. : Output is protected against overload and short circuit by crossover characteristics. : Output Over voltage trip protection. <b>METERING :</b> One voltmeter and one ammeter to monitor output voltage and current simultaneously. <b>REMOTE MONITORING :</b> 0 to 5 V<sub>DC</sub> Voltage signal at rear panel corresponds to output voltage of 0 to full value. : 0 to 5 V<sub>DC</sub> Voltage signal at rear panel corresponds to output current of 0 to full value. <b>EXTERNAL PROGRAMMING :</b> External programming of current by voltage signal. (0 to 5 V<sub>DC</sub> external voltage signal controls current from 0 to full value) : External programming of current by resistance. (0 to 500 Ohms resistance controls current from 0 to full value) <b>INPUT REQUIREMENT:</b> 230 V<sub>AC</sub>, 50 Hz, single phase. <b>iii) Pair of Auxiliary Coils</b> Inner Diameter : 100 mm. Width : Less than 20 mm Outer Diameter : 130 mm Total NI : 300 Magnetic Field : 20 Gauss maximum at its centre. The coils should be epoxy cast for strength and rigidity. <b>Auxiliary Coil Power Supply</b> Output Current : 0 to 5 Amps continuously variable with Coarse and fine controls. Ripple : 1 mA r.m.s. Current Stability : 0.1% long term with constant external Effects. Load : Capable of driving inductive load. Protection : Output is protected against overload and Short circuit by crossover characteristics. Metering : One voltmeter and one ammeter to monitor Output voltage and current simultaneously. Input Requirement : 230 V<sub>AC</sub>, 50 Hz, single phase.</p>	1
52	<p><b>DSP Lock-In Amplifier</b></p>	<p>Voltage inputs: Single-ended or differential Sensitivity : better than 3 nV to 1 V Current input :10<sup>6</sup> or 10<sup>8</sup> V/A Input impedance : Voltage 10 MΩ + 25 pF, AC or DC coupled Current 1 kΩ to virtual ground Gain accuracy : ≤±1 %</p>	1



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		<p>Noise (typ.) : 6 nV/VHz at 1 kHz Line filters : 50/60 Hz and 100/120 Hz (Q = 4 ) CMRR : 100 dB to 10 kHz, decreasing by 6 dB/oct above 10 kHz Dynamic reserve : &gt;100 dB (without prefilters) Frequency range : 0.001 Hz to 100 kHz Reference input : TTL or sine ( &lt; 450 mVpp min.) Phase resolution : 0.01° Absolute phase error : &lt; 1° Relative phase error : &lt;0.002° Orthogonality : 90° ± 0.002° Phase noise : Maximum 0.005° rms at 1 kHz Phase drift : &lt; 0.01°/°C below 10 kHz, Harmonic detection : 2F, 3F, ... nF to 100 kHz (n &lt; 20K) Frequency resolution : 4½ digits or 0.1 mHz, whichever is greater Amplitude : 0.004 to 5 Vrms into 10 kΩ (2 mV resolution), 50 Ω output impedance, 50 mA maximum current into 50 Ω Amplitude accuracy:1 % Oscillator Outputs : Sine, TTL Interfaces: IEEE-488.2 and RS-232 interfaces standard. All instrument functions should be controlled and read through IEEE-488.2 or RS-232 interfaces. Power:240 VAC, 50 Hz</p> <p><b>Displays</b> Channel 1: 4½-digit LED display with 40-segment LED bar graph. X, R, X-noise, Aux 1 or Aux 2. The display can also be any of these quantities divided by Aux 1 or Aux 2. Channel 2: 4½-digit LED display with 40-segment LED bar graph. Y, θ, Y-noise, Aux 3 or Aux 4. The display can also be any of these quantities divided by Aux 3 or Aux 4. Offset : X, Y, R can be offset up to ±105 % of full scale. Expand: X, Y, R should be expanded by 10× or 100×. Reference : 4½-digit LED display</p> <p><b>Inputs and Outputs</b> CH1 output : X, R, X-noise, Aux 1 or Aux 2, (±10 V) CH2 output : Y, θ, Y-noise, Aux 3 or Aux 4, (±10 V) or vice versa X, Y outputs : In-phase and quadrature components (±10 V) Aux. A/D inputs:4 BNC inputs, 16-bit, ±10 V, 1 mV resolution Aux. D/A outputs:4 BNC outputs, 16-bit, ±10 V, 1 mV resolution Sine out: Internal oscillator analog output TTL out: Internal oscillator TTL output Data buffer : Two 16k point buffers. Data is recorded at rates to 512 Hz and read through the computer interfaces. Trigger in:(TTL) Trigger synchronizes data recording Remote preamp: Should provide power to the optional preamps</p>	
53	LCR meter	<p>Measurement modes : LCR mode, Continuous measurement mode : Measurement parameters : Z, Y, θ, X, G, B, Q, R<sub>dc</sub> (DC resistance), Rs (ESR), Rp, Ls, Lp, Cs, Cp, D (tanδ), σ, ε Measurement range : 100 mΩ to 100 MΩ, 10 ranges (All parameters are determined according to Z) Display range Z 0.00 m to 9.99999 GΩ, Y: 0.000 n to 9.99999 GS, θ: ± (0.000° to 180.000°), Q: ± (0.00 to 9999.99), Rdc: ± (0.00 m to 9.99999 GΩ), D: ± (0.00000 to 9.99999), Δ%: ± (0.000 % to 999.999 %), or other Basic accuracy : Z ±0.05% rdg. θ: ±0.03° (representative value, Measurable range: 1 mΩ to 200 MΩ)</p>	1



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		<p>Measurement frequency : 4 Hz to 8 MHz (5 digits setting resolution, minimum resolution 10 mHz)  Measurement signal level : [Normal mode: V mode/CV mode]  4 Hz to 1.0000 MHz: 10 mV to 5 V (maximum 50 mA)  1.0001 MHz to 8 MHz: 10 mV to 1 V (maximum 10mA)  [Low impedance high accuracy mode: V mode/CV mode]  4 Hz to 1.0000 MHz: 10 mV to 1 V (maximum 100 mA)  [Normal mode: CC mode]  4 Hz to 1.0000 MHz: 10 <math>\mu</math>A to 50 mA (maximum 5 V)  1.0001 MHz to 8 MHz: 10 <math>\mu</math>A to 10 mA (maximum 1 V)  [Low impedance high accuracy mode: CC mode]  4 Hz to 1.0000 MHz: 10 <math>\mu</math>A to 100 mA (maximum 1 V)  [DC resistance measurement]  Measurement signal level: Fixed at 1 V  DC bias measurement      Generating range: DC voltage 0 V to 2.50 V (10 mV resolution)  In low Z high accuracy mode: 0 V to 1 V (10 mV resolution)  Output impedance      Normal mode: 100 <math>\Omega</math>, Low impedance high accuracy mode: 10 <math>\Omega</math>  Display 5.7-inch color TFT with touch panel  Functions Comparator, BIN measurement (10 categories for 2 measurement parameters), Trigger function, Open/short compensation, Contact check, Panel loading/saving, Memory function  Interfaces      EXT. I/O( HANDLER) ,USB, USB flash drive, LAN, GP-IB, RS-232C, BCD  Power supply      100 to 240 V AC, 50/60 Hz, 50 VA max.  Dimensions and mass      330 mm (12.99 in) W <math>\times</math> 119 mm (4.69 in) H <math>\times</math> 230 mm (9.06 in) D, 4.2 kg (148.1 oz)  Accessories      Power cord <math>\times</math>1, Instruction manual <math>\times</math>1, LCR application disc (Communications user manual) <math>\times</math>1</p>	
54	X-Ray	<p>X-Ray apparatus set-up for performing following experiments:</p> <ul style="list-style-type: none"> <li>➤ Fluorescence of a luminescent screen due to X-rays</li> <li>➤ Investigating the attenuation of X-rays as a function of the absorber material and absorber thickness</li> <li>➤ Investigating the wavelength dependency of the attenuation coefficient</li> <li>➤ Investigating the relationship between the attenuation coefficient and the atomic number Z</li> <li>➤ Bragg reflection: diffraction of X-rays at a monocrystals</li> <li>➤ Investigating the energy spectrum of an X-ray tube as a function of the high voltage and the emission current</li> <li>➤ Duane-Hunt relation and determination of Planck's constant</li> <li>➤ Edge absorption: filtering X-rays</li> <li>➤ Moseley's law and determination of the Rydberg constant</li> <li>➤ Fine structure of the characteristic X-ray radiation of a molybdenum anode</li> <li>➤ Compton effect: verifying the energy loss of the scattered X-ray quantum</li> <li>➤ Bragg reflection: determining the lattice constants of monocrystals</li> <li>➤ Fine structure of the characteristic X-ray radiation of a copper anode</li> </ul> <p>X-Ray apparatus must have following important features:</p> <ul style="list-style-type: none"> <li>▪ High-resolution control of the goniometer with the possible angular resolution of 0.01°.</li> <li>▪ High-resolution collimator and High-resolution counter tube holder.</li> <li>▪ Fully-featured, microprocessor-controlled apparatus.</li> <li>▪ Simple one button one function handling. Apparatus must be usable without</li> </ul>	1





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		<p>PC.</p> <ul style="list-style-type: none"> <li>▪ Two integrated large 4-digit displays (25 mm high).</li> <li>▪ Integrated Scintillation screen.</li> <li>▪ The high-voltage system, X-ray tube and experiment chamber all should be contained within a radiation-proof housing with full protection. Two independent safety circuits for doors, high voltage and emission current.</li> <li>▪ Lab VIEW and MATLAB driver for windows should be available for user defined controlling and measuring.</li> <li>▪ With two easy to change X-Ray tubes (Cu and Mo)</li> <li>▪ Must be supplied with all required accessories e.g. End window counter, absorption accessory, absorber foils, Compton accessory, LiF crystal, KBr crystal etc.</li> </ul>																																								
55	CRO	<ul style="list-style-type: none"> <li>➤ DC - 30MHz Bandwidth</li> <li>➤ 1mV/div Sensitivity on Both Channels</li> <li>➤ CH1, CH2 (Independent Channels), CH1 &amp; CH2 (Alternate / CHOP), CH2 INVT, ADD and SUBTRACT</li> <li>➤ X-Y Operation</li> <li>➤ 40ns/div to 0.2s/div Time Base</li> <li>➤ 140mm Rectangular CRT with Internal Graticule</li> <li>➤ Triggering to 40MHz</li> <li>➤ Z Modulation (TTL Level)</li> <li>➤ 8 x 10 cm. Display</li> <li>➤ TV Triggering Frame (V) &amp; Line (H)</li> <li>➤ MAINS Trigger</li> <li>➤ Variable Hold Off</li> <li>➤ Built-in Component Tester / Comparator</li> </ul>	15																																							
56	Spin coating unit	<p><b>Specifications</b></p> <table border="0"> <tr> <td>Actuator</td> <td>:</td> <td>Brushless DC motor</td> </tr> <tr> <td>Spinning speed</td> <td>:</td> <td>60 - 9999 rpm</td> </tr> <tr> <td>Substrate diameter</td> <td>:</td> <td>30 mm to 70 mm</td> </tr> <tr> <td>Power input</td> <td>:</td> <td>230V, 50Hz</td> </tr> <tr> <td>Read out</td> <td>:</td> <td>20 x 4 line LCD</td> </tr> <tr> <td>Spin chamber</td> <td>:</td> <td>Nylon</td> </tr> <tr> <td>Acceleration</td> <td>:</td> <td>5 - 2000 rpm / sec</td> </tr> <tr> <td>Spinning Speed Accuracy</td> <td>:</td> <td>&lt; 5%</td> </tr> <tr> <td>Programmable parameters</td> <td>:</td> <td>Speed , acceleration, dwell time and no. of steps</td> </tr> <tr> <td>Maximum no of steps</td> <td>:</td> <td>9</td> </tr> <tr> <td>Program memory</td> <td>:</td> <td>9 programs (non – volatile)</td> </tr> <tr> <td>Dimension</td> <td>:</td> <td>400 mm Depth 275mm W x 500mm H</td> </tr> <tr> <td>Weight (appx.)</td> <td>:</td> <td>34 Kg</td> </tr> </table>	Actuator	:	Brushless DC motor	Spinning speed	:	60 - 9999 rpm	Substrate diameter	:	30 mm to 70 mm	Power input	:	230V, 50Hz	Read out	:	20 x 4 line LCD	Spin chamber	:	Nylon	Acceleration	:	5 - 2000 rpm / sec	Spinning Speed Accuracy	:	< 5%	Programmable parameters	:	Speed , acceleration, dwell time and no. of steps	Maximum no of steps	:	9	Program memory	:	9 programs (non – volatile)	Dimension	:	400 mm Depth 275mm W x 500mm H	Weight (appx.)	:	34 Kg	1
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		Power input : 230V, 50Hz PC connectivity : Serial port (RS 232) Stroke length max. : 150mm Drawing speed min. : 2 micron/sec Drawing speed max. : 9000 micron/sec Program memory : 5 programs Dimension : 630 x 348 x 416 mm Max. power consumption : 460 Watts. Weight : 45 Kg (appx.)	
58	Distilled Water Plant	Table top Double distillation stage Capacity – 2 l/h	1
59	DIGITAL STORAGE OSCILLOSCOPE, 2-channel, 100 MHz	THE OSCILLOSCOPE SHOULD HAVE FOLLOWING FEATURES:- <ul style="list-style-type: none"> <li>• Upgradable in nature in terms of bandwidth , addition of Digital Logic channels to work on Mixed Signal mode Any kind of Upgradability will be an added feature</li> <li>• Deep Memory to capture long events at high sampling speeds and Deep Memory transfer over interface bus.</li> <li>• Standard USB Interface. Optional LAN &amp; VGA Interface Module should be available.</li> <li>• Built in Hardware counter and Trigger Output.</li> <li>• Built in help System.</li> <li>• Optional Built-in Function Generator in MHz range feature will be an added feature.</li> <li>• Optional Application related packages like Digital Volt Meter, Power Measurement Application, Mask Test should be quote separately.</li> <li>• Instrument Should capable for touch, and the exclusive Zone touch trigger,</li> <li>• Standard Segmented Memory will be an added feature.</li> <li>• Can be interfaced with Vector Signal Analysis Software</li> <li>• Can be display in Time/frequency domain correlation.</li> </ul> <b>DETAILED TECHNICAL SPECIFICATIONS:-</b> <b>1. Oscilloscope (Vertical System)</b> a) No. of Channels : 2 b) Bandwidth : 100 MHz (Can be upgradable upto 1 GHz) c) Vertical Resolution : 8 bit, 12 bit in High resolution mode d) Maximum Input : 300 Vrms, 400 Vpk e) Input Sensitivity : 1 mV/div – 5 V/div f) Input Impedance : 1 MΩ / 50 Ω Selectable <b>2. Horizontal System</b> a) Time Base Range : 5 nsec/div to 50 sec/div b) Trigger System : Edge, Pulse Width, Pattern, Duration, TV, Sequence, <b>3. Oscilloscope Acquisition System</b> a) Max. Sampling Rate : 5 GSa/s all channels, 2.5 GSa/s half channel b) Max. Memory Depth : 4 Mpts. Standard Segmented Memory c) Peak Detect : 250 pS <b>4. Waveform Update Rate</b> : Up to 1,000,000 waveforms / sec <b>5. Display System</b> : 8.5 inch, WVGA Colour TFT LCD. <b>6. Built in Arbitrary waveform generator</b> : Optional for Sine, Square, Pulse, Ramp, Noise, DC, Arbitrary and AM, FM, FSK Modulation.	1



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		<b>7. Built in Interface</b> :: USB 2.0 high speed device. Optional LAN & Video Output for external monitors.	
60	100 MHz 2 Channel 4 Trace with Delayed Sweep Oscilloscope	Elegant, Surface Mounting Technology, DC to 100MHz Bandwidth, 1mV/div Sensitivity on Both Channels, CH1 & CH2 Independent Channels Algebraic Addition and Subtraction, X-Y Operation, 5ns/div to 0.2s/div Time Base, A ALT B SWEEPS - Max. 4 Traces, A and B Delayed Sweep, HOLD-OFF Time Adjustable, Scale Illumination, Z Modulation, 8 x 10 cm Display Internal Graticule, Auto Focus ,TV Triggering Frame (V) & Line (H), Line Trigger	2
61	3 MHz Function Generator Optional : GPIB & RS-232 Interfaces	1. 1 $\mu$ Hz to 3.1 MHz frequency range 2. 1 $\mu$ Hz frequency resolution 3. Sine, square, ramp, triangle & noise 4. Phase-continuous frequency sweeps 5. 10 Vpp into 50 $\Omega$ 6. Optional RS-232 and GPIB interfaces	2
62	Lock-In Low Noise Preamplifier	<b>Low Noise Preamplifier</b> <b>Input</b> Inputs AC or DC coupled, single-ended or differential Input impedance 100 M $\Omega$ + 25 pF Maximum input 3 Vpp CMRR 100 dB from DC to 1 kHz (100 mVrms common mode input at 1kHz , gain=100, low noise mode. Decreases by 6 dB/octave from 1 kHz to 1 MHz) Noise 4 nV/ $\sqrt$ Hz at 1 kHz Gain 1 to 50,000 in 1-2-5 sequence. Vernier gain in 0.5 % steps. Gain stability 200 ppm/ $^{\circ}$ C Bandwidth -3 dB at 1.2 MHz (typ.) Flatness $\pm$ 0.3 dB to 300 kHz (gains up to 1000) <b>Filters</b> Signal filters 2 configurable (low-pass or high-pass) 6 dB/octrolloff filters. -3 dB points should be settable in a 1-3-10 sequence from 0.03 Hz to 1 MHz. Gain allocation High Dynamic Reserve — Gain should be increased after the signal filters to prevent overloading. Low Noise — Gain should be increased before the filters to improve noise figure. <b>Output</b> Maximum output 10 Vpp into 50 $\Omega$ and 600 $\Omega$ Filter reset Long time constant filters may be reset with front-panel button. DC drift 5 $\mu$ V/ $^{\circ}$ C referred to input (DC coupled) Distortion 0.01 % at 1 kHz Rear panel $\pm$ 12 VDC @ 200 mA referenced to amplifier ground <b>General</b> External gating TTL input sets gain to zero Interfaces RS-232 Power 240 VAC/ 50Hz. Internal batteries should provide more than 12 hours of operation between charges. Batteries should be charged while connected to the line.	1
63	Electrometer / High Resistance Meter	<b>Instrument Should Have Following Features :</b> <ul style="list-style-type: none"> <li>• Instrument should have Graphical capability (Meter View, Graph View, Histogram View, Roll View),</li> <li>• Auto navigation,</li> <li>• 100,000 points sample buffer,</li> <li>• Interface (USB, LAN, GPIB, LXI Core), Free PC control software</li> <li>• Charge measurement down to 2 nC range with 6.5 digits resolution</li> </ul>	1



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		<ul style="list-style-type: none"> <li>Temperature and humidity measurements</li> </ul> <p><b>Detail Technical Specification :</b> Measurement resolution : 6½ digits Current measurement : 0.01 fA - 20 mA Minimum range : 2 pA Resistance measurement : Up to 10 PΩ (10<sup>16</sup> Ω) Voltage measurement : 1 μV - 20 V Input resistance : &gt; 200 TΩ Charge measurement : 1 fC - 2 μC Voltage source : Up to ±1,000 V Minimum resolution : 700 μV Maximum reading rate : 20,000 rdg/s</p>	
64	Mixed Domain Oscilloscope	<p><b>CHARACTERISTICS SPECIFICATION</b> No of Channels : 4 Analog and 1 RF Channel in build within one Instrument chasis, <b>Instrument Features should have following capabilities:</b> Time Domain Analysis Frequency Domain Analysis Inbuilt Digital Voltmeter &amp; Frequency Counter Inbuilt Protocol Analyzer Should have provision to upgrade Arbitrary Function Generator (50MHz) Analog Characteristics Analog Bandwidth 500 MHz on all Analog Channels Bandwidth Upgradation Provision should have provision to upgrade the oscilloscope BW up to 1GHz. Analog Waveform Capture Rate : &gt; 235,000 Wfms/Sec Record Length : 10 Mpoints per channel Analog Channel Sample Rate : 2.5 GSa/s on all channel Rise Time : 800 ps DC Gain : Accuracy ± 1.5% for 5 mV/div and above. Vertical Resolution : 8 bits (&gt; 11 bits in HI-RES mode) Horizontal System Time base Range : 1ns to 1000s Input Impedance &amp; Coupling : AC, DC 1 MΩ ±1%, 50 Ω ±1%, 75 Ω ±1% Vertical Sensitivity : 1 MΩ 1 mV/div to 10 V/div 50 Ω 1 mV/div to 1 V/div Time Base Accuracy : ± 10 ppm Math : Should have provision to define extensive algebraic expressions including waveforms, reference waveforms, mathfunctions. Spectrum Math : Add or subtract frequency-domain Modes : Sample, Average, Hi-RES, Peak Detect, Envelope, Roll &amp; Fast Acq RF Channel Freq : 9 kHz -200 MHz with option to upgrade upto 3 Ghz. Arbitrary Function Generator : Characteristics Frequency Range (Sine Wave) 0.1 Hz to 50MHz Standard Functions : Sine, Square, Pulse, Ramp/Triangle, DC, Noise, Sin(x)/x (Sinc), Gaussian, Lorentz, Exponential Rise, Exponential Decay, Haversine, Cardiac, and Arbitrary Amplitude Range Hi-Z : 20 mVp-p to 5 Vp-p 50 Ω : 10 mVp-p to 2.5 Vp-p Arbitrary Waveform Software : Have compatibility with the remote software in which any arbitrary waveform can be defined and can be exported to AFG. General Characteristics : Standard Accessories Power Card, 250 MHz bandwidth, 10X, 3.9 pF. One passive voltage probe per analog channel), Calibration certificate, Manual, PC Software.</p>	1
65	Modular Power	<b>Instrument Should Have Following Features :</b>	1



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	Supply	<p>1.up to 4 outputs can be added with different modules in 1U of rack space          2.Flexible, modular system: Can mix and match power levels and performance levels to optimize application          3.Performance modules for critical test requirements          4.Value modules for basic DC power requirements          5.Fast command processing times to improve throughput          6.Connect via GPIB, LAN, or USB          7.Fully compliant to LXI Class C specification          8.Output Disconnect and Polarity Reversal Relays.</p> <p><b>Detail Specification:</b></p> <ul style="list-style-type: none"> <li>•DC Output Ratings: 60 V, 0.8A / 1.6 A, 50 W / 100 W</li> <li>•Output Ripple and Noise: CV peak-to- peak : 25 mV CV RMS : 9 mV</li> <li>•Programming Ranges: 70 mV – 61.2 V ; 2.5 m A – 1.7 A</li> <li>•Programming Accuracy: Voltage 0.1% + 60 mV Current 0.15% + 20 mA</li> <li>•Measurement Accuracy: Voltage 0.05% + 10 mV Current 0.1% + 30 mA</li> <li>•Interface Capabilities : GPIB, USB 2.0, 10/100 LAN, Built-in Web Server</li> </ul>	
66	Pulse Generator	<p>Max Amplitude (50Ω Load) : 100 V          Pulse Width : 1 ns          Pulse Width measured at 20% Rise PRF, Internal Trigger :          External Trigger : 1 KHz – 10 MHz, 0 – 10 MHz          Polarity : Please quote for Positive, Negative and dual polarity as options          Propagation Delay : &lt; 40 ns (Ext Trigger in to Pulse out)          Jitter : + 15 ps (Ext Trigger in to Pulse out)          DC Offset : Please quote as an option          An externally-generated DC offset could be applied to terminals provided (+50 Volts, 250 mA max)          Trigger required : (ext trig mode) TTL-level (Low: 0V, High: +3V to +5V), ≥ 10 ns, RIN = 50Ω          Sync Output+3 Volts, width varies with PRF (always &gt; 10 ns), drives ≥50Ω          Sync Delay Variable 0 to 80 ns, Sync out to pulse out          Monitor output : Option          should provide (-21 dB) attenuated coincident replica of the main output, into 50 Ohms.          Power : 220 - 250 VAC / 50 Hz          Controls : A one-turn amplitude control and two pulse width controls (TR and TF) that are used to shape the output impulse after the operating pulse repetition frequency and the output amplitude are set.          It should have internal clock oscillator, which should be controlled by a one-turn fine control and a decade range switch. A delay control and a sync output should be provided for sampling oscilloscope triggering purposes. The units should also be triggered externally using a TTL-level pulse.          Accessories : Please quote necessary accessories such as cables, connectors adapters etc. as option.</p>	1
67	Components to measure Magneto-resistance multilayer samples of	<ul style="list-style-type: none"> <li>• <u>Type of Cryostat: Optical, closed cycle refrigerator, Sample in vacuum</u></li> <li>• Temperature range: 4.2 K - 300 K</li> <li>• Cooling power of bare cold head: Should be &gt;/=0.13 watt at 4.2 K</li> <li>• The sample holder should have enough area to fit samples having a size of 4x4 sq.mm</li> <li>• Active area of the sample: 1x1 sq.mm</li> </ul>	1



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		<ul style="list-style-type: none"> <li>• 1.25" O.D. sub-compact vacuum shroud with 1.5" square window block with four (4) 0.75" diameter clear view, epoxy sealed, UV grade fused Silica windows</li> <li>• Water cooled compressor with full charge of high-purity Helium gas</li> <li>• Compressor noise level: <math>\leq</math> 68 dBA</li> <li>• Compressor size should not exceed: 604 mm x 430 mm x 504 mm high</li> <li>• Orientation: Free (Cooling Capacity Loss: should not exceed 30%)</li> <li>• Should contain Two stage cold head and 3 meter flex lines;</li> <li>• Cold head control cable (6 meter), wrenches, and operating manual;</li> <li>• Sub-compact cold finger extension with 0.88" diameter copper sample mount, 50 ohm control heater and calibrated GaAlAs temperature sensor;</li> <li>• 0.1" O.D. sub-compact optical radiation shield mounted on first stage;</li> <li>• <b>Sub-compact gold plated OFHC copper 8-pin resistivity sample holder (no nickel) with tapped hole for temperature sensor; four twisted pairs (=8 wires) of Ph-Br wires from the resistivity sample holder to a feedthrough has to be installed by the vendor.</b></li> <li>• Instrumentation skirt with one (1) 10-pin electrical feedthrough for heater and temperature sensors, one (1) 10-pin electrical feedthrough for customer use, two (2) blank feedthrough ports, evacuation valve and safety pressure relief valve;</li> </ul>	
68	Electromagnet	<ul style="list-style-type: none"> <li>• 50 mm poles</li> <li>• 45 degree brackets,</li> <li>• unipolar power supply, with GPIB Interface (&amp; GMW LabVIEW driver)</li> <li>• cable, SGA to 3472-70,</li> <li>• Mounting bracket for the cryostat to mount on the magnet</li> </ul>	1
69	Xenon arc lamp	Xenon arc lamp (300 W) with lamp housing, lamp mount and focusing optics for SLM monochromators. The unit features a current-controlled power supply (10-23 A) with a time counter	



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70	Fiber Coupled Computer Controlled Monochromator with Computer Controlled Software And Optical Chopper	<p>Continuous wave source (230-850 nm) including Xenon arc lamp (300 W) with power supply, lamp mount, focusing optics, monochromator, shutter and fiber bundle. All the components, with the exception of the lamp's power supply, are solidly mounted onto a base plate that can be positioned on any laboratory bench top. The unit features a current-controlled power supply (10-23 A) with a time counter. The stepper-motor-driven, high-sensitivity, single-grating monochromator, (100 mm focal length, 0-900 nm wavelength range, F/3.5 aperture) is equipped with 32x32 mm, aberration corrected, concave, holographic grating. The quartz fiber optics bundle, 1.8 meter long, 3 mm in diameter, is mounted on the exit slit of the monochromator and allows positioning of the light on the sample</p> <p>Optical Chopper:</p> <ul style="list-style-type: none"> <li>• Chopper control: PLL motor controller</li> <li>• Chopping speed: 10 to 130 Hz with 2 sector blade to 2,000 Hz with 30 sector blade</li> <li>• Chopping accuracy: 0.016 Hz with 2 sector blade 0.096 Hz with 30 sector blade</li> <li>• Communication interface: USB 2.0</li> <li>• Software: driver included</li> <li>• 2 sector blade included.</li> </ul> <p>Solar cells are not usually measured at chopping frequencies over 130 Hz. Optional item : 30 slots chopper blade</p>	
71	Complete Laser Diode Operation Starter Set	<p>Complete Laser Diode / Temperature Controller Set incl. Mount, Optical Accessories for 350-700 nm. Benchtop LD Current Controller <math>\pm 500</math> mA HV: (LD current control range 0 to <math>\pm 500</math> mA, Compliance Voltage &gt; 10V, Photocurrent control range - 25<math>\mu</math>A to 10mA, Small signal 3dB bandwidth, CC mode- DC to 150kHz) Benchtop Temperature Controller, <math>\pm 2</math> A / 12 W: (TEC current control range - 2A to +2A, Compliance Voltage &gt; 6V, Maximum output power 12W, Thermistor control range 10<math>\Omega</math> to 20k <math>\Omega</math>/100 <math>\Omega</math> to 200 k<math>\Omega</math>, Supported IC centre – AD590, AD592, LM135, LM335) TEC LD Mount: (TE-Cooled Mount for <math>\varnothing 5.6</math> mm &amp; 9mm ,G Pin Code, <math>I_{L-2A}</math>, <math>I_{TEC-5A}</math>, <math>V_{TEC-5V}</math>, Lasers)</p>	1



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		All Connection Cables Spanner Wrench for M9 x 0.5 Housing, Length 1", Spanner Wrench for SM1 Adapters, Length 1", TR Series Post: $\varnothing 1/2$ " Optical Post, SS, 8-32 Setscrew, 1/4"-20 Tap, L = 3", Post Holder for TR Series Post: $\varnothing 1/2$ " Post Holder, Spring-Loaded Hex-Locking Thumbscrew, L = 3", Mounting Base: 2" x 3" x 3/8", Optic Adapter: SM1 to M9 x 0.5 Lens Cell Adapter, Locking Nut: SM1 (1.035"-40) Locking Ring, $\varnothing 1.25$ " Outer Diameter, Grounding Wrist Strap: Fabric Grounding Wrist Strap, Adjustable Circumference, 6 ft Coiled Cord, AR-Coated Collimation Optic : For 350 - 700 nm: f = 4.51 mm, NA = 0.55 Mounted Geltech Aspheric Lens, AR: 350-700 nm	
72	Optical light source	660 nm, 50 mW, TO Can, $\varnothing 5.6$ mm, 135mA, G Pin Code, Opnext Laser Diode.	2
		Laser diode - 2, 850nm 30 mW, $\varnothing 5.6$ mm, A Pin Code, Laser Diode,	1
		Deep Red (660 nm) Mounted LED, 1200 mA, 640 mW (Min)	2
73	LED power supply	T-Cube LED Driver, 1200 mA Max Drive Current (Power Supply Not Included)	1
		15 V Power Supply Unit for a Single T-Cube	1
74	Optical components	f = 3.30 mm, NA = 0.47 Mounted Rochester Aspheric Lens, AR: 350-700 nm	1
		f = 2.97 mm, NA = 0.60, Mounted Geltech Aspheric Lens, AR: 400-600 nm	1
		f = 4.00 mm, NA = 0.60, Mounted Geltech Aspheric Lens, AR: 400-600 nm	1
		SM1 to M6 x 0.5 Lens Cell Adapter	1
		f = 4.51 mm, NA = 0.55, Mounted Geltech Aspheric Lens, AR: 600-1050 nm	1
		f = 2.00 mm, NA = 0.50, Mounted Geltech Aspheric Lens, AR: 600-1050 nm	1
		Adjustable Collimation Adapter with AR-Coated Lens for 350 - 700 nm	1
		Aspheric Condenser Lens, $\varnothing 25$ mm, f=20.1 mm, NA=0.60 ARC: 350-700 nm	1
		Aspheric Condenser Lens, $\varnothing 20$ mm, f=18.1 mm, NA=0.52, ARC: 350-700 nm	1
		Aspheric Condenser Lens, $\varnothing 30$ mm, f=26 mm, NA=0.55, ARC: 350-700 nm	1
		Aspheric Condenser Lens, $\varnothing 45$ mm, f=32.1 mm, NA=0.60, ARC: 350-700 nm	1
		Plano-Convex Lens, $\varnothing 1$ ", f = 30.0 mm, AR Coating: 350-700 nm	1
		Plano-Convex Lens, $\varnothing 1$ ", f = 50.0 mm, AR Coating: 350-700 nm	1
		Plano-Convex Lens, $\varnothing 1$ ", f = 75.0 mm, AR Coating: 350-700 nm	1
		Plano-Convex Lens, $\varnothing 1$ ", f = 100.0 mm, AR Coating: 350-700 nm	1
		Plano-Convex Lens, $\varnothing 1$ ", f = 150.0 mm, AR Coating: 350-700 nm	1
		Plano-Convex Lens, $\varnothing 1$ ", f = 200.0 mm, AR Coating: 350-700 nm	1
		Plano-Concave Lens, $\varnothing 1/2$ ", f = -30.0 mm, AR Coating: 350-700 nm	1
		Plano-Concave Lens, $\varnothing 1$ ", f = -50.0 mm, AR Coating: 350-700 nm	1
		Plano-Concave Lens, $\varnothing 1$ ", f = -75.0 mm, AR Coating: 350-700 nm	1
		Plano-Concave Lens, $\varnothing 1$ ", f = -100.0 mm, AR Coating: 350-700 nm	1
		$\varnothing 12.7$ mm Optical Post, SS, M4 Setscrew, M6 Tap, L = 75 mm, 5 Pack	2
		$\varnothing 12.7$ mm Post Holders, Spring-Loaded Hex-Locking Thumbscrew, L=75 mm, 5 Pack	2
		Mounting Base, 50 mm x 75 mm x 10 mm, 5 Pack	10
		$\varnothing 1$ " (SM1) Series Slim Lens Tube Slip Ring, M4 Tapped Hole	5
		Adjustable Lens Mount: $\varnothing 0.77$ " ( $\varnothing 19.6$ mm) to $\varnothing 2.28$ " ( $\varnothing 57.9$ mm), M4 Tap	5
		Adjustable Lens Mount: $\varnothing 0.28$ " ( $\varnothing 7.1$ mm) to $\varnothing 1.80$ " ( $\varnothing 45.7$ mm), M4 Tap	5
		Imperial Lens Mount For 1" Optics, 8-32 Tap	6
		SM1 Lens Tube, 0.5" Thread Depth, One Retaining Ring Included	3
		Right-Angle Clamp for $\varnothing 1/2$ " Posts, 5 mm Hex	1
		Self-Centering Lens Mount, $\varnothing 0.15$ " ( $\varnothing 3.8$ mm) to $\varnothing 3.00$ " ( $\varnothing 76.2$ mm), M4 Tap	1





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		Fingers for Optic Cleaning Fixture, Replaces Standard SCL03 and SCL04 Fingers	1
		Mounting Base, 50 mm x 75 mm x 10 mm	1
		Ø12.7 mm Post Holder, Spring-Loaded Hex-Locking Thumbscrew, L=50 mm	1
		Ø12.7 mm Optical Post, SS, M4 Setscrew, M6 Tap, L = 50 mm	1
		Ø12.7 mm Optical Post, SS, M4 Setscrew, M6 Tap, L = 30 mm	1
75	Broad band Light Source	<p>Broad band Light Source with housing, power supply, Lamp. Mechanical adapter for Xe source for Entrance port</p> <ul style="list-style-type: none"> <li>Lamp: Xenon lamp</li> <li>Power: 300 W</li> <li>Input Power Supply: 210–240 VAC, 50 Hz</li> <li>Power Rating: 0 to 300 watts</li> <li>Operating Voltage: ca. 10 to 24 volts</li> <li>Operating Current: ca. 2 to 8 amps</li> </ul> <p>Setting of lamp in current, voltage and power: according to manufacturer recommendations</p>	1
76	Impedance Analyzer	<p>Desired Frequency Range : 20 Hz to 50 MHz</p> <p><b>The Instrument should have following basic features :</b></p> <ul style="list-style-type: none"> <li>Measurement of Parameters :Z ,  Y , <math>\theta</math>, R, X, G, B, L, C, D, Q, Complex Z, Complex Y, <math>V_{ac}</math>, <math>I_{ac}</math>, <math>V_{dc}</math>, <math>I_{dc}</math>.</li> <li>Four terminal measurement with Auto Balancing Technique.</li> <li>Save / Recall feature for saving Instrument setups.</li> <li>Frequency can be upgradable upto 120 MHz in the same Instrument</li> <li>Different kind of Test Fixture like Liquid Dielectric, SMD, Dielectric Constant Measurement facility with Dielectric Test Fixture, Parallel Electrode, Axial Radial, Magnetic Material etc. should be available and compatible.</li> <li>Instrument should have inbuilt Higher DC Bias.</li> <li>The Instrument can be interfaced with device modeling software.</li> <li>At least 10 Independent Marker provision for traces should be there with Marker search option.</li> <li>Data Analysis features like Equivalent Circuit Analysis, Limit Line Test would be preferred.</li> <li>Should support applications like Impedance measurement of Passive Components, CV characteristics analysis of Semiconductor components, Impedance Evaluation of PCB's, Permittivity, Permeability &amp; Loss tangent evaluation of Dielectric &amp; Magnetic Materials.</li> <li>Should have Built-in Help menu with Operation Manual. With Windows 7 OS.</li> </ul> <p><b>Detailed Specifications :-</b></p> <p>Following are measurement ranges of parameters.</p> <ul style="list-style-type: none"> <li>➤ Test Frequency : 20 Hz to 50MHz</li> <li>➤ R, X : 25 mΩ to 40 MΩ.</li> <li>➤ C : 1 fF to 1 F</li> <li>➤ L : 10 pH to 1 MH</li> <li>➤ Voltage Signal Level : 5 mVrms to 1 Vrms</li> <li>➤ Current Signal Level : 200 μArms to 20 mArms , 20μA</li> <li>➤ Basic Accuracy : ± 0.08% (typical ± 0.045%)</li> <li>➤ Z measurement Range : 25 mΩ to 40 MΩ (± 10% measurement accuracy)</li> <li>➤ Frequency Resolution : 1 mHz</li> <li>➤ Measurement Time : 30msec/point ,freq ≥ 100kHz upto 50 MHz.</li> <li>➤ Low Trace Noise : &lt; 0.002 Ω</li> <li>➤ DC Bias : 0 to ± 40 V/± 100 mA, 1 mV/40 μA resolution</li> </ul>	1



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	<ul style="list-style-type: none"><li>➤ Sweep Type : Linear frequency, log frequency, linear signal level, linear DC bias, log DC bias, Segment.</li><li>➤ Sweep Parameters : Frequency, Signal Voltage/Current, DC bias voltage/current.</li><li>➤ No. of Measurement Points : 2 - 1601</li><li>➤ No. of Channel/Traces : 4 channel/4 trace.</li><li>➤ Cable Length : 0m, 1m, 2m.</li><li>➤ Interface : USB (front 2, rear 4), LAN, USBTMC, GPIB, 24 bit I/O</li><li>➤ Data Storage : SSD (built-in), external devices connected via USB Ports.</li><li>➤ Trigger : Internal, External, and Manual. With Point Trigger/Sweep Trigger.</li><li>➤ Ranging : Auto /Manual</li><li>➤ Display : 10.4 inch TFT color LCD with touch screen</li><li>➤ Power Supply : 230 V, 50 Hz. ac.</li></ul> <p><b>Accessories required :</b></p> <ul style="list-style-type: none"><li>a) Test fixture for axial lead components.</li><li>b) 1m port extension cable for impedance analyser.</li><li>c) Open termination.</li><li>d) Short termination.</li></ul>	
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## 1. General Instructions:

Intending bidder may download the tender documents from the website <https://wbtenders.gov.in> directly with the help of Digital Signature Certificate. Last date of submission 17.11.2016at 12 hrs.Bid opening time 18.11.2016at 13 hrs.

## 2. Submission of bids:

Both Technical bid and Financial Bid are to be submitted concurrently duly digitally signed by the Company personnel who is in the pay roll of the Company (having Authorization from the Company management) in the website [http:// wbtenders.gov.in](http://wbtenders.gov.in). All papers must be submitted in English language.

## 3. Time Schedules for the e-tender:

The Time Schedule for obtaining the Bid Documents, Pre Bid meetings, the submission of bids and other documents etc. will be as per the list provided in Clause No. 10 given below.

## 4. Eligibility for Quoting:



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Manufacturers or Dealers/Distributors/Agents duly authorised by the manufacturers who are able to supply the assured quantities as per requirement & have requisite Annual Average Turnover, as per clause no. 5, are only eligible for quoting. Manufacturers not having the capability to supply the required quantity solely need not apply. Failure of submission of declaration of full supply will lead to cancellation of tender. Further, vendors who were declared black listed and/or insolvent by any Govt. Concern/any Institutions in the Country for particular item or items are not eligible to participate in the current tender for that item or items.

## 5. Annual Turnover Requirements:

Vender having average annual Turn Over for last three financial years is more than Rs 30 lakh in India or equivalent foreign currency in the respective foreign country for the year 2013-14, 2014-15 & 2015-16 are eligible to participate in the Tender.

## 6. Submission of Tenders

### 6.1 General process of submission

Tenders are to be submitted online through the website stated in Clause 1. All the documents uploaded by the Tender Inviting Authority form an integral part of the contract. Tenderers are required to upload all the tender documents along with the other documents, as asked for in the tender, through the above website within the stipulated date and time as given in the Tender. Tenders are to be submitted in two folders at a time, one is Technical Bid and the other is Financial Bid .The tenderer shall carefully go through the documents and prepare the required documents and upload the scanned documents of originals in Portable Document Format (PDF) to the portal in the designated locations/folders of Technical Bid. He needs to fill up the BOQ in the designated cell and upload the same in designated location of Financial Bid. The documents uploaded are virus scanned and digitally signed using the Digital Signature Certificate (DSC). Tenderers should specially take note of all the addendum/corrigendum related to the tender till the bid submission ends. Tenderers should in general upload the latest documents as part of the tender, however, in case of failure in uploading such documents, it will be deemed that they (tenderers) have taken note of such latest documents including addendum/corrigendum, if published till the bid submission ends.

### 6.2 Technical Bid

The Technical Bid should contain scanned copies and/or declarations in the following standardised formats in two covers (folders):

- I. Technical File (Statutory Cover) containing:
  1. **Annexure –**
    - a) BasicInformation (Vide Annexure I) *(to be submitted in “Annexure” folder)*



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- b) Application for Tender - (Vide Annexure II) (to be submitted in “Annexure” folder)
- c) Authorization letter - (Vide Annexure III) (to be submitted in “Annexure” folder)
- d) Affidavit Proforma- (Vide Annexure IV) (to be submitted in “Annexure” folder)
- e) DECLARATION ON KNU - (Vide Annexure V) (to be submitted in “Annexure” folder)
2. Technical details of the Items Quoted (Bidders must submit Technical specification along with Catalogue of the item quoted in “**Technical Details**” Folders.
3. Bidder must submit Audited Balance Sheet and Profit and loss Account for last 3 (three) financial year namely 2013-14, 2014-15 & 2015-16 in “**Accounts**” folder.

**Note: Tenders will be summarily rejected if any item in the statutory cover is missing.**

II. My Document (Non-Statutory Cover) containing as follows:

Sl.No.	Category	Sub-Category	Sub-Category Description
1	Certificates	Certificates	PAN Card of the Bidder
			VAT/ CST Registration Certificate
2	Company Details	Company Details 1	Trade Licence/Enlistment Certificate/ License for Electrical works (Mandatory for Electrical installation work)
			Registration with Registrar of Companies
			Memorandum of Articles for Limited Companies.
3	Credential	Credential 1	a) Copy of the purchase order for supplying Similar nature of items at least for last 2 years in an Institute of Higher Learning b) Brief User List preferably for users in West Bengal in an Institute of Higher Learning
4	Financial Information	Payment Certificate 1	Income Tax Returns submitted for the Financial year 2013-14, 2014-15, 2015-16
		Payment Certificate 2	VAT/CST Returns (of the last quarter) for the year 2013-14, 2014-15, 2015-16
		BALANCE SHEET	P/L AND BALANCE SHEET 2013-14, 2014-15, 2015-16



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## 6.3 Financial Bid

The Financial Bid should contain Bill of Quantities (BOQ) in one cover (folder):

- The tenderers are not required to submit hard copies of Technical File (Statutory) or My documents (Non-Statutory). Submission of hard copy of Financial Bid is strictly prohibited and only be submitted through on line through NIC portal.

### 8. Evaluation of the tenders

During the tender evaluation process, the “Technical Bid” will be opened first. Those Bidders who have qualified in respect of the essential & other requirements in “Technical Bid” will be identified and their financial bid will be opened. The financial bid of those Tenderer failing to meet the technical & other requirements laid down in the tender will not be opened and be rejected. The Tenderer offering the item found suitable and as per the tender specifications will only be selected. Final selection of the lowest bidder in respect of Financial Bid is subject to further verification. The Financial Bids of only those tenderers who have been considered as Technically Qualified will be opened. If found suitable in the context of above pre qualification etc, the Tenderer quoting the lowest rate will be considered as successful.

## 9. TERMS & CONDITIONS REGARDING PURCHASE POLICY OF TENDERING AUTHORITY:

### 9.1 Bid Information:

- Partial Quotation within the same item will not be accepted and tender will be liable for cancellation.**
- All duties, taxes and other levies payable by the contractor under the contract shall be included in the total price but should be indicated separately in the price bid.
- The rate quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.
- Bidder must follow the instruction for filling up BOQ as per Clause 6.3.**

- Evaluation of Quotation:** The Purchaser will evaluate and compare the quotations determined to be substantially responsive stage wise. Firstly, Technical Bid will be evaluated based on and thereafter Price Bid for technically qualified bidders will be evaluated for selection of vender.

- Award of Contract:** The purchaser will award the contract to the bidder whose quotation has been determined to be substantially responsive both technically and commercially. Purchaser reserves the right to reject any or all the tender, wholly or partly, without assigning any reason thereof and shall not be bound to accept the lowest bid.

- Warranty:** Besides Battery the vendor shall be fully responsible for the comprehensive onsite warranty (3/3/3-part/labour/onsite) for all other equipments, accessories etc. including spares and services for a period of three years from the date of installation. For Battery, Warranty will be effective at least for 12 months. In all respect, warranty period will start from the date of joint installation Report. Bidder must upload Warranty confirmation certificate showing the warranty period as per the above clause in “**TECHNICAL DETAILS**” folder.

- Adequate infrastructural facility:** The bidder/manufacturer should have registered establishment set up in Kolkata/Asansol or its adjacent locality. In addition, the bidder/manufacturer must have authorised service



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centre with adequate numbers of sound service personnel. Representatives from both establishment and service centre must be made available within 24 hours after making calls from the KaziNazrul University. Documents in support of establishment and service centre with pay roll sheet must be uploaded in “**TECHNICAL DETAILS**” folder.

9.6 **Training Facility:** User training regarding the operation of the equipments shall be arranged by the supplier/vendor at no extra cost if required.

9.7 The bidder (Technical Bid) must be submitted along with the copies of OEM license or authority from the manufacturer. Document in support of the same must be uploaded by the bidder in “**TECHNICAL DETAILS**” folder. If the bidder is not the manufacturer/brand owner, proper manufacturer’s/brand’s authorization must be uploaded in the said folder.

9.8 **Credentials:** Documents of previous experience of the job, at least 2 years, must be submitted along with the tender.

9.9 **DSIR Certification:** KaziNazrul University does possess the privilege for availing the facility of procuring items at Concessional Customs Duty and without incurring any excise duty as per DSIR certification.

9.10 **Make & Model:** Bidder must mention Make and Model in the Information Sheet as given vide Annexure-I and must send the product details/catalogue/brochure in the “**Technical Details**” folder.

9.11 **Time Schedule:** The supply and installation work must be completed within 15 days from the date of receipt of the purchase order.

9.12 **Validity of offer:** A bidder should spell out in the tender that it shall remain valid for a minimum period of six months from the date of opening of the tender and during this period, the bidder shall not be entitled to revoke or cancel its offer.

9.13 **Place of delivery:** HoD, Physics Department, Laboratory Building, KaziNazrul University, Asansol. Nazrul Road, Kalla More, P.O. – Kalla C. H. Asansol – 713340

9.14 **Payment Schedule :** Payment be made after delivery and installation of the items.

9.15 **Performance Security:**

Successful bidder should deposit Performance Security money equivalent to the 10% of the order value in the form of DD/Bank Guarantee immediately before issuing purchase order from the University. Such security will be refunded after completion of the warranty period in normal case without any accrued interest. University may forfeit the Security Money in the event of the following circumstances:

- i) Selected bidder withdraws the bid before expiry of its validity but after receipt of the Purchase Order.
- ii) Selected bidder does not accept the order after issuing the same or fails to enter into a contract within validity period of offer.
- iii) Selected bidder fails to supply the items within the scheduled time as specified in the Purchase Order



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- iv) If before expiry of the warranty period, the supplied items break down or do not function satisfactorily due to the cause related with the item itself or for its installation and not for any reason caused by the University Authority and the supplier denies to take the responsibility to make the supplied items in order.
- v) In case of any false submission /statement by the bidder
- vi) In case of any refusal to abide by terms and conditions or refusal to enter into a written agreement as per prefixed terms and conditions

9.16 **Quantity Changeability:** Quantity as stated in the tender document may subject to change at the time of issuing purchase order due to the fund crunch or for other valid reasons.

9.17 **Requisite Documents to be submitted:** Bidder must have adequate documents relating to Trade License and updated returns for Income Tax, VAT, Audited Statement of Accounts and other documents as sought for under Clause 6.2.II of this tender.

9.18 **Turnover Criterion:** Bidder must have average annual turnover of more than **Rs.50 lakh** in last three financial year ending 2015-16.

9.19 **Disposal of Disputes:** In case of any dispute, the University's decision will be treated as the final and conclusive. All legal actions are subject to Kolkata jurisdiction only.

9.20 The bidders are required to quote for each item separately in terms of basic price and all other charges. Prices can be quoted in Indian Currency only (₹)..

**Discretion of the University:**

9.21 University may take decision about non-purchase of the said equipment even after selection of vendor due to its fund constraints.

9.22 University may seek documents from the bidder in addition to the scanned documents sent by them at the time of uploading technical bid for verification and evaluation of tender.

9.23 University reserves the right to relax any clause as stated hereinabove for selection of responsive vender.

**10. Dates & Information:**

Sl.No	Activities	Date & Time
1	Date of uploading in the e-tender portal of NIC : <a href="https://wbtenders.gov.in">https://wbtenders.gov.in</a>	25.10.2016
2	Documents download Start Date(online)	25.10.2016
3	Bid Submission Start Date(on line)	25.10.2016
4	Document Download & Bid Submission Closing Date (Online)	17.11.2016 at 5.00PM
5	Bid Opening Date (Online) – Technical Bid	18.11.2016 at 12.00



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6	Date of uploading list for technically qualified bidder (online)	To be notified
7	Date of opening of Financial Bid	To be notified
8	Date of uploading of list of bidders along with the approved Rate	To be notified
9	Pre bid meeting date at Asansol	27.10.2016 (at 12 hrs.)

11. Opening the financial bid as per schedule will BE NOTIFIED LATER ON.

Financial bid can be seen & accessed by the bidder through the NIC Portal on line after opening of financial bid on line. No objections raised by any Bidder in this respect will be entertained by the University. No informal tender will be entertained in the Bid further.

12. During the scrutiny, if it comes to the notice to tender inviting authority that the credential or any other paper found incorrect/ manufactured/ fabricated, that bidder would not allowed to participate in the tender and that application will be rejected outright without any prejudice.

13. The Tender Selection Committee reserves to right to cancel the KNU. due to unavoidableCircumstances and no claim in this respect will be entertained.





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## Annexure I

### FURNISHING BASIC INFORMATION

(To be furnished in the Company's official letter pad)

1.	Name of the Bidder	
2.	Address for Communication	
3.	Contact Number(s)	
4.	E-mail ID	
5.	Trade License No. (Please enclose copy of Trade License)	
6.	PAN(Please enclose copy of PAN Card)	
7.	VAT No.(Please enclose copy of VAT)	
8.	Do you have previous experience for supplying similar nature of Items at Educational Institute of Higher Learning (Please enclose copy of Purchase order & user list, if yes)	Yes/No (Please put tick mark)
9.	Annual Turnover as per Audited P/L ACCOUNTS & BALANCE SHEET	2013-14: Rs..... 2014-15: Rs..... 2015-16: Rs..... Average Annual Turnover: Rs.....
10.	Status of the bidder(Please enclose copy authenticating your	Manufacturer/Dealer/Distributer/Selling Agent/Stockiest (Please put tick mark)



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status)	
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I hereby declare that the above information is true and correct to the best of my knowledge and belief. In case of any false/wrong/misleading information, I shall be bound to take the decision taken by the University.

Signature of the Bidder

(With Seal)

## Annexure II APPLICATION FOR TENDER

(To be furnished in the Company's official letter pad with full address and contact no, E mail address etc)

To  
Registrar  
KaziNazrul University  
Asansol

Sub: .....for the Supply of .....

Ref: - \_\_\_\_\_ No .....dated .....

Sir,

Having examined the pre-qualification & other documents published in the ....., I /we hereby submit all the necessary information and relevant documents for evaluation:

1. That the application is made by me / us on behalf of .....in the capacity ..... duly authorized to submit the offer. The authorization letter from the Company is attached in Annexure II.
2. We accept the terms and conditions as laid down in the tender document vide **Clause 9** and declare that we shall abide by it throughout the tender period including its extensions, if any.
3. We have gone through the Tender Document thoroughly and quoted the tendered items keeping in mind all sorts of information as furnished in the tender document including Corrigendum/Addendum as published from time to time
4. We are offering rate for the following item /items with manufacturing capacity and assured supply to the KaziNazrul University



# KAZI NAZRUL UNIVERSITY

Nazrul Road, Kalla More, P.O. – Kalla C. H.  
 Asansol – 713340, Dist.-Burdwan, West Bengal  
 Phone No.: 0341-227 0456, FAX: 0341-2271024,  
 Email: [regknuasn@gmail.com](mailto:regknuasn@gmail.com), Website: [www.knuedu.in](http://www.knuedu.in)

S. No.	INSTRUMENT NAME	Quantity	Make	Model No.	Quantity	Offer Validity
1.	MEASUREMENT OF DIELECTRIC CONSTANT (with temperature variation)	2				
2.	ZEEMAN EFFECT EXPERIMENT	1				
3.	Electron-Beam Evaporation System	1				
4.	e/m EXPERIMENTAL SET UP	2				
5.	FRANCK-HERTZ EXPERIMENT	2				
6.	FOUR PROBE EXPERIMENTAL SET UP	2				
7.	MAGNETORESISTANCE SET UP	2				
8.	TWO PROBE SET UP	2				
9.	ELECTRONS SPIN RESONANCE SPECTROMETER	2				
10.	HALL EFFECT EXPERIMENT	2				
11.	STUDY OF P-N JUNCTIONS	2				
12.	STUDY OF A TRANSISTOR AMPLIFIER (RC COUPLED) CUM FEED – BACK AMPLIFIER	4				
13.	STUDY OF A MODULATION AND DEMODULATION WITH BUILT IN CARRIER FREQUENCY SOURCE	4				
14.	STUDY OF BASIC OPERATIONAL AMPLIFIER	4				
15.	STUDY OF ASTABLE AND MONOSTABLE MULTIVIBRATOR	4				
16.	STUDY OF AN INTEGRATED CIRCUIT REGULATOR	4				



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17.	HELIUM NEON LASER BASIC SET-UP	1				
18.	Measurement of velocity of Sound by ultrasonic interferometer	2				
19.	J-K Master Slave Flip-Flop	4				
20.	Frequency response characteristics of an inverting operational amplifier	4				
21.	Frequency response characteristics of a LC filter circuit	4				
22.	Faraday effect (measurement of Verdet Constant)	1				
23.	Pockel effect	1				
24.	(a) Laser optics Lab (b) 4 nos spare able source with detector (c) 4 more optical board with table	2				
25.	Digital Multimeter	5				
26.	CE amplifier characteristics (CE mode)	4				
27.	LDR characteristics	4				
28.	Quinck's tube method	1				
29.	Planck's Constant Experiment	2				
30.	Digital Microvoltmeter	4				
31.	Digital Nanoammeter	4				
32.	High Voltage Power Supply	2				



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33.	True RMS A.C. Millivoltmeter	4				
34.	Electromagnet & Power Supply	2				
35.	Digital Gaussmeter	2				
36.	Digital Gaussmeter	2				
37.	Digital Gaussmeter	2				
38.	PID Controlled Oven	2				
39.	Travelling Microscope	2				
40.	Digital Microscope	1				
41.	Regulated Power Supply	10				
42.	Function Generator	10				
43.	Spectrometer	2				
44.	Microbalance	1				
45.	Hot Plate	4				
46.	Horizontal Tube furnace	1				
47.	Box furnace	1				
48.	KBr Press + one more KBr Die	1				
49.	Source Measure Unit	1				
50.	6 ½ Digital Multimeter	1				
51.	i) Electromagnet ii) Magnet Power Supply iii) Pair of Auxiliary Coils mounted on Pole Pieces and its Power Supply to give a resolution of 1 Gauss by the field produced by laboratory electromagnet	1				
52.	DSP Lock-In Amplifier	1				



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53.	LCR meter	1				
54.	X-Ray	1				
55.	CRO	15				
56.	Spin coating unit	1				
57.	Dip coating unit	1				
58.	Distilled Water Plant	1				
59.	DIGITAL STORAGE OSCILLOSCOPE, 2-channel, 100 MHz	1				
60.	100 MHz 2 Channel 4 Trace with Delayed Sweep Oscilloscope	2				
61.	3 MHz Function Generator Optional : GPIB & RS-232 Interfaces	2				
62.	Lock-In Low Noise Preamplifier	1				
63.	Electrometer / High Resistance Meter	1				
64.	Mixed Domain Oscilloscope	1				
65.	Modular Power Supply	1				
66.	Pulse Generator	1				
67.	4.2 K - 300 K Optical, closed cycle refrigerator, Sample in vacuum	1				
68.	Electromagnet	1				
69.	Xenon arc lamp					



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70.	Fiber Coupled Computer Controlled Monochromator with Computer Controlled Software And Optical Chopper	1					
71.	Complete Laser Diode Operation Starter Set	1					

4. In the event of being selected, I will make the supply within the stipulated period excepting the condition which is beyond our control.

Date :-

Signature of applicant including title and capacity in which application is made.

Contact no:

E-mail address:

Postal Address:

Annexure III

(Authorization letter in favour of the applicant (other than Managing Director/ Proprietor/Partner) from the competent authority.)

FORMAT

(To be furnished in the Company's official letter pad with full address and contact no, E mail Address etc)

(TO WHOM IT MAY CONCERN)

This is to certify that Mr. ....(Name),

Employee of this Organisation as..... (Official Designation) is hereby authorised to submit tender online, Vide ..... No....., Dated ..... on behalf of the Organisation.



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Signature of the competent authority with Seal.....(Signature of the Authorised Person)

Signature of Mr.....is hereby attested.

Signature of the competent authority with Seal

## ANNEXURE IV

(Affidavit Proforma)

(To be furnished in Non – Judicial Stamp paper of appropriate value duly notarized)

I, Sri/Smt.....The Managing Director/Proprietor (etc.) of the Firm. .... (Name of the firm)At (address).....Do hereby solemnly affirm and declare as follows:

1. That I have not ever been convicted of any offence making myself liable to be disqualified to supply of Chemicals / Equipments/other items to any Govt. or Govt. undertaking Organization /Institution in the State of West Bengal or other State or States.
2. That no case is pending against me or against my firm in any criminal court of law to supply of Chemicals, Lab. Chemicals & Laboratory Equipment and other items to the Govt. or Govt. undertaking Organization / Institution in the State of West Bengal or other State or States ( If any case is pending, state the details ).
3. That, I also declare that if any information subsequently found incorrect or false will it automatically render the tender submitted by me cancelled and make me liable for penal/legal action as per law of the country.
4. That my concern has not yet been declared bankrupt by any banking or money lending agency duly licensed by RBI nor has it been considered doubtful by any Government concern so far as the solvency of the organisation is concerned.
5. That I do further affirm that the statements made by me in this tender are true to the best of my knowledge and belief and all the documents attached are genuine & correct.

Deponent(s).





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## ANNEXURE V

(Affidavit Proforma)(To be furnished in Non – Judicial Stamp paper of appropriate value duly notarized)

### DECLARATION ON KNU

(To be typed in company letter pad, scanned and uploaded)

I, the undersigned, do hereby declare that on behalf of my organization, I will comply all the formalities that are required to be complied as per KNU and I will observe all clauses of the KNU (including Terms & conditions). In case of any non-observance of any clause(s) , we will be bound to follow the decisions taken by the Kazi Nazrul University for taking decision related with the tender..

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Full signature of the Person

(Designation with Seal)

Date:

Place: