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इलाहाबाद-211004 (भारत)
Motilal Nehru National Institute of Technology Allahabad
 Allahabad-211004 (India)
 An Institute of National Importance as Declared by NIT Act, GOI, 2007

INVITATION FOR SUPPLY OF Lab Equipment
(For Contracts value estimated to cost less than Rs.25 lakhs)

1	Closing Date/Time for submission of Quotations	04/01/2016; 15:00 Hrs.
2	Opening Date/Time of Quotations	04/01/2016; 15:30 Hrs.
3	Quotations to be submitted at	The Office of Faculty-In-charge (Purchase) M.N.N.I.T. Allahabad, Allahabad-211 004 (U.P.)
4	Place of opening of quotations	The Office of Faculty-In-charge (Purchase) M.N.N.I.T. Allahabad, Allahabad-211 004 (U.P.)
5	Tender Fee	Rs. 200.00 (Non-refundable), in form of a Demand Draft drawn in favor of DIRECTOR, MNNIT Allahabad.
6	Earnest Money Deposit (EMD)	Rs. 47,000.00/- (Rs. Forty seven thousand only) , in form of FDR/Bank guarantee, from any of the Commercial Banks, drawn in favour of "Director, MNNIT Allahabad" payable at Allahabad, and valid for a period of 45 days beyond the final bid validity period

You are invited to submit your most competitive quotation for the following items. The quotation should be sent directly to the undersigned under Sealed Cover marked "Quotation Reference No., Date", and "The Due Date:

Sl. No.	Description of item with Specification	Qty.	Place of Delivery
	Lab Equipments (Detailed specifications attached at Annexure-B)		
1.	Solar Panel along with junction box, 30m cable and mounting arrangement for 1000 W its not inbuilt	1 No.	MNNIT Allahabad
2.	Three Phase Fully controlled IGBTs based Voltage source inverter	1 No.	
3.	Boost Converter with Inductor	1 No.	
4.	Analog Mixed signal card for FPGA board along with power supply. AMS card with 1 No 15V DC power Supply contains Inbuilt Two 4- channel ADCs, 16bit, 1 MSPS, 10V, bipolar & PWM Two 4- channels, 15V	1 No.	
5.	FPGA Nano Board with Xilinx FPGA	1 No.	
6.	LEM based Current and voltage Sensors with inbuilt signal conditioning & power supplies Hall effect sensors: Current Sensors – 3 Nos.; Voltage Sensors – 7 Nos.; Zero Crossing detector – 2 Nos.; Irradiance Sensor -1 No.; Temperature Sensor- 1 No.	-	
7.	Dual Layer Protection for Grid Connection Modes: 1. Programmable protection using specially designed control algorithms in FPGA 2. Backup protection using Industrial relays 3. Directional relays for current direction 4. Short Circuit and Over current protection 5. Inverse time over current relays 6. Contactors for Synchronizing 7. Static Transfer Switch 8. Relays and Contactors	1 set	
8.	Programmable Source as Grid Emulator	1 No.	
9.	Connecting Cables (PVC Insulated and shielded made for EMI protection)	1 No.	
10.	Spare parts/ICs /Discrete components/Printed Circuit Board(PCB), Miniature Circuit Breaker	1 No.	

The sealed tenders must be submitted in the Office of the Faculty In-charge (Purchase), on or before **due date & time as mentioned above** in the office of the undersigned, in the presence of bidder's authorized representatives, who choose to attend and shall sign a register evidencing their attendance.

The tender/quotations NOT submitted in the prescribed format or Incomplete in any respect will be outrightly rejected.

Faculty in-Charge, Purchase
MNNIT Allahabad

GENERAL TERMS & CONDITION (GCC)

1. **Bid Price:**
 - (a) The contract shall be for the full quantity as described above. Corrections, if any, shall be made by crossing out, initialing, dating and rewriting.
 - (b) All duties, taxes and other levies payable by the contractor under the contract shall be included in the total price.
 - (c) The rates quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.
 - (d) The prices should be quoted in Indian Rupees only for indigenous items. For items/imported items, the prices should be quoted in foreign currency.
 - (e) Each bidder shall submit only one quotation.
2. **Validity of Quotation:**

Quotation shall remain valid for a period not less than **120 days** after the deadline date specified for submission.
3. **Evaluation of Quotations:**
 - (a) The purchaser will evaluate and compare the quotations determined to be substantially responsive, i.e., which
 - (i) are properly signed; and
 - (ii) conform to the terms and conditions, and specifications.
 - (iii) will be with tender fees, and EMD required, if any.
 - (b) The Quotations would be evaluated separately for each item.
4. **Award of Contract:**

The Purchaser will award the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.

 - Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of contract.
 - The bidder whose bid is accepted will be notified for the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be incorporated in the purchase order if falls under Govt. purchase rules, i.e., GFR-2005
5. **Formats and Signing of Bid:**
 - Each & every pages of the submitted bid must carry the page numbers.
 - The bidders are not allowed to make additional and alteration in the tender document, any additions and alteration in the tender document, any additions and alterations shall be at bidder's risk. Conditional/modified tender are liable to be rejected.
 - The tender/quotations NOT submitted in the prescribed format or Incomplete in any respect will be outrightly rejected.
 - If the bid submitted without compliance sheet details of items the bid will be outrightly rejected.
 - The bid shall be typed or written in indelible ink and shall be signed by the Bidder/Tenderer or a person or persons duly authorized to bind the Bidder/Tenderer to the Contract. All pages of the bid, except for unamended printed literature, shall be initialed by the person or persons signing the bid.
 - Any interlineations, erasure or overwriting shall be valid only if they are initiated by the persons or persons signing the bid.
 - The Bidder shall furnish information as described in the Form of Bid on commissions or gratuities, if any, paid or to be paid to agents relating to this Bid, and to contract execution if the Bidder is awarded the contract.
6. **Payment condition:** 100% Payment shall be made only after satisfactory delivery of items in good condition and receive satisfactory report by competent authorities after completion of the works. Advance payment is not permitted.
7. Normal Commercial warranty/ guarantee shall be applicable to the supplied goods.

INSTRUCTIONS/GUIDELINES TO BIDDERS (ITB)

1. Bidders who had supplied the Government departments, PSUs/NITs/IITs/IIITs and reputed Institutions and Organizations should only apply.
2. The bidder should enclose the client list with contact address along with Phone/Fax for reference, for the quoted item.
3. Please quote the prices of F.O.R. Motilal Nehru National Institute of Technology Allahabad, Allahabad.
[NOTE: Custom/Excise Duty Exemption Certificate will be provided by MNNIT Allahabad after receiving your request letter for the same.]
 - **MNNIT Allahabad avails Custom Duty Exemption in terms of Government Notification N. 51/96-Customs dated 23 July, 1996, and Central Excise Duty Exemption in terms of Government Notification N. 10/97-Central Excise dated 01 March, 1997, as amended from time to time.**
4. The Bidders are requested to submit their Quotation with EMD in the form of Demand Draft/ Bank Guarantee/ Short term Deposit of the cost of items in favor of "The Director, MNNIT, Allahabad" payable at Allahabad. Quotation without EMD will be summarily rejected. EMD's of all Bidders will be returned back after the purchase order /contract agreement is issued to successful bidder.
5. Successful Bidders must have to submit the performance security @10% of the purchase order or contract value and it will be retained up to the warranty period.
6. The bidder should enclose relevant documents wherever necessary to substantiate his eligibility.
7. The Institute is eligible for and can provide necessary documentation for Custom/Excise and Octroi exemption on demand, if permitted under rule.
8. Motilal Nehru National Institute of Technology Allahabad, Allahabad, reserves the right to reject, accept any or whole or part of any of the tender without assigning any reason thereof and no claim will be heard. In case of dispute, the decision of The Director, MNNIT, and Allahabad will be final and binding.
9. If the successful bidder is not able to supply the goods items within the delivery date specified in the purchase order, the purchase order will be automatically treated as cancelled after expiry of delivery date period. The vendor will have to submit an undertaking in this regard that this condition is acceptable to him. In case of extra ordinary circumstances the vendors must send a request for extension of validity of purchase orders, with proper justification prior to the expiry of validity date for consideration.
10. In case of sophisticated items, an on-site training needs to be provided with no extra cost.
11. The quotation must be accompanied by leaflets/operation manuals/books etc.
12. Wherever applicable the vendors must quote the branded /desired items.

CHECK LIST

(ON THE LETTER HEAD OF THE BIDDER)

The Bid will be the compilation of following documents, along with required supporting documents. No document in support of minimum eligibility criteria will be accepted / entertained after opening of tender.

Sl. No	Documents
1.	Cover letter by bidder (On the Letter Head of the Bidder)
2.	Tender Fee
3.	Earnest Money Deposit (EMD), if required
4.	Ciential List for quoted item
5.	Annexure-A : Bid Proposal Sheet (On the Letter Head of the Bidder)
6.	Annexure-B : Technical Specifications of Lab Equipments (On the Letter Head of the Bidder)
7.	Annexure-C : Compliance of bidder with reference to the equipment (On the Letter Head of the Bidder)
8.	Annexure-D : Proforma for direct payment/transfer (On the Letter Head of the Bidder)
9.	Annexure-E : PRICE BID (On the Letter Head of the Bidder)

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ANNEXURE-A

BID PROPOSAL SHEET
(ON THE LETTER HEAD OF THE BIDDER)

To
Faculty In-charge (Purchase)
MNNIT Allahabad, Allahabad

Subject: Supply of “**Lab Equipments**” at MNNIT Allahabad, Allahabad.

Dear Sir,

We, the undersigned Tenderers, having read and examined in detail the specifications as specified in this document in respect of Supply of “**Lab Equipments**” at MNNIT Allahabad, Allahabad do hereby propose to supply the required products and services.

Tender No.				
Tender Fees submitted		YES / NO (Please strike off whatever is not applicable)		
Amount	Mode	Date of Issue	Name of Bank	Valid up to
	Demand Draft			
EMD submitted		YES / NO (Please strike off whatever is not applicable)		
Amount	Mode	Date of Issue	Name of Bank	Valid up to
	Demand Draft			

- (i) **ADDITIONAL PURCHASE/WORK ORDER:** We understand that the MNNIT Allahabad, Allahabad, in case of the requirements may also place repeat purchase order/work order on the company. In such cases, we shall accept and execute all the purchase/work order placed on us by MNNIT Allahabad, Allahabad.
- (ii) **BID PRICING:** We further declare that the prices stated in our proposal are in accordance with your Terms & Conditions in the bidding document. We further understand that the quantities as specified in this Tender may increase or decrease at the time of Award of Purchase Order as per the requirements of MNNIT Allahabad, Allahabad.
- (iii) **QUALIFYING DATA:** We confirm that we satisfy the qualifying criteria and have attached the requisite documents as documentary proofs. In case you require any further information/documentary proof in this regard during evaluation of our bid, we agree to furnish the same in time to your satisfaction.
- (iv) **CONTRACT PERFORMANCE SECURITY:** We hereby declare that in case the contract is awarded to us, we shall submit the performance Guarantee Bond in the form of Bank Guarantee for the amount of 10% of the total order value.
- (v) **PAYMENT TERMS:** We hereby declare that in case the contract is awarded to us, we agree with payment terms specified in the tender documents.
- (vi) **CERTIFICATE AND DECLARATION:**
 - a) I/We certify that no addition/modification/alteration has been made in the Original Tender Document. If at any stage addition /modification /alteration is noticed in the Original Document, I/We will abide by the terms and conditions contained in the original tender document, failing which MNNIT Allahabad reserves the right to reject the tender and/or cancel the contract
 - b) It has been certified that all information provided in tender form is true and correct to the best of my knowledge and belief. We hereby declare that our proposal is made in good faith, without collusion or fraud. No forged /tampered document(s) are produced with tender form for gaining unlawful advantage. We understand that MNNIT Allahabad is authorized to make enquiry to establish the facts claimed and obtained confidential reports from clients.
 - c) In case it is established that any information provided by us is false / misleading or in the circumstances where it is found that we have made any wrong claims. Further MNNIT Allahabad is also authorized to blacklist our firm/company/agency and debar us in participating in any tender/bid in future.
 - d) I / We assure the Institute that neither I /We, nor any of my /our workers, will do any act which is improper / illegal during the execution in case the tender is awarded to us.
 - e) I / We assure the Institute that I / We will NOT be outsourcing any work specified in the tender document, to any other firm.
 - f) Neither I / We, nor anybody on my /our behalf will indulge in any corrupt activities /practices in my /our dealing with the Institute.
 - g) Our Firm / Company / Agency is not been blacklisted or banned by any Govt. Department, PSU, University, Autonomous Institute or any other Govt. Organization.
 - h) I/We certify that, I have understood all the terms & conditions (GCC and ITB etc.), as indicated in enquiry of the tender document, and hereby accept all the same completely.
 - i) I/We, further certify that I/We, possess all the statutory /non-statutory registrations, permissions, approvals, etc., from the Competent Authority for providing the requisite services,
 - j) We understand that you are not bound to accept the lowest or any bid you may receive.
 - k) I/We hereby declare that this tender on acceptance communicated by you shall constitute a valid and binding contract between us.
 - l) I/We certify that the submitted quotation is duly paginated and contains from page no. 1 to

Date:

Signature and Seal of the Manufacturer/Bidder

TECHNICAL SPECIFICATIONS OF "Lab Equipments"
(ON THE LETTER HEAD OF THE BIDDER)

Lab Equipments

1.	Solar Panel
	2500 W Solar Panels along with junction box, cabling (min. 30 m) and mounting arrangement
2.	Three Phase fully controlled IGBT based Voltage Source Inverter
	<p>I/P AC Voltage:- 415 Volt DC Voltage:- 600 Volt O/P AC Voltage:- 415 Volt O/P AC Current 30 Amp Switching Frequency upto 20 kHz Fundamental Frequency 50 Hz Type of Cooling:- Forced Air Ambient Temp:- 40 Deg Duty Class:- Class I Cooling Method Forced Air Cooled.</p> <p>IGBT Details V-IGBT=6. Generation Trench V-IGBT CAL4= Soft switching 4 Generation CAL-diode. Isolated copper baseplate using DCB technology (Direct Copper Bonding). Increased power cycling capability. With integrated gate resistor. Low switching losses at high di/dt.</p> <p>Bridge Module Three phase bridge rectifier Blocking voltage of 1600 V High surge current carrying capability Large isolated base plate & Easy mounting</p> <p>Gate Driver It should interface and isolate the Control Unit/Primary Circuit from the secondary which is directly connected to the high power. Gate Driver controls the IGBT's dynamic behavior and its short circuit protection. Input signal level is 0/15V. Interlocking time between the input signals is 3μs. It monitors the errors: power supply under-voltage (below 13 V), short-circuit between Collector and Emitter. The error reset time is typically 9μs. On detection of error/fault, the Gate Driver switches off the IGBT. The IGBT switching speed may be adjusted by the resistors RGON and RGOFF. The two parameters (Rce, Cce) define the values and time delays for the comparison of an internal reference with the monitored value of Vce(sat).</p> <p>Kit Details 3-phase teaching kit should consist of 3-phase uncontrolled rectifier and 3-phase IGBT based controlled Inverter. It should also have a brake chopper. 3-phase 415 V input is applied to the uncontrolled rectifier (SKD100/16) using an autotransformer The dc output of the Rectifier is given to the input of the IGBT based inverter. DC capacitor bank is connected in between the rectifier and inverter as source to the inverter. 3 phase 415 V ac Output is achieved from the inverter and is provided for the Motor Interface. Driver is the interface unit between the power module and controller. Each Driver drives 2 switches in a Module. +15V/0V supply is given to Vs and GND. Alternate ON/OFF pulses of +15V are given to Vin1 and Vin2. Vin1 corresponds to TOP IGBT and Vin2 corresponds to BOTTOM IGBT. ERROR is triggered when Vs falls below 13.9 V and Short circuit of IGBT. ERROR output is taken to the controller for turning off the system during occurrence of the error.</p> <p>Capacitor & Snubber Rectified DC input is given to electrolytic filtering capacitors. Each capacitor is 4700 μF / 450 V. 2 capacitors are connected in series to have equivalent capacitance of 2350 μF / 900 V. Resistors of value 27 k / 20 W are connected across each capacitor for voltage balancing. Snubber Capacitors of 0.22 μF / 1500 Vdc (4 nos) are connected across the dc link for voltage overshoot protection. The snubbers limit the over-voltages during commutations and as a consequence reduce the losses. They are kept very close to the device to reduce the inductance between the switches and the capacitors.</p> <p>Cooling Teaching kit stack assembly should be provided with forced air cooling. IGBT modules should be mounted on 250 mm heat sink (extruded type). Forced air-cooling should be provided by Hi cool Fan . 230VAC 1ph. should be applied to the Fan input terminals provided on the unit. Flow of air is 3 m/s. Input to the fan is 1-Φ 230 V Supply</p> <p>Thermal Protection Normally Closed Thermal contact switch is used for protection against thermal runaway. The position of the thermal switch normally closed when its temperature is below the threshold temperature (80 deg C) & it changes to normally open above 80 deg C. After cooling down, it again retains it normally closed position. Thermal switch is placed at the warmest point on the heat sink. The 5 level inverter has to emulate sags, swells, voltage fluctuations and act as the grid.</p>

3.	Boost Converter with Inductor
	<p>General Specifications I/P DC Voltage:- 250 Volt DC Voltage:- 600 Volt O/P DC Voltage:- 600 Volt O/P DC Current 30 Amp Switching Frequency upto 20 kHz Fundamental Frequency 50 Hz Type of Cooling:- Forced Air Ambient Temp:- 40 Deg Duty Class:- Class I Cooling Method Forced Air Cooled. Inductor for boost operation of sufficient rating to be included, Current 30A</p> <p>IGBT Details V-IGBT=6. Generation Trench V-IGBT CAL4= Soft switching 4 Generation CAL-diode. Isolated copper baseplate using DCB technology (Direct Copper Bonding). Increased power cycling capability. With integrated gate resistor. Low switching losses at high di/dt.</p> <p>Gate Driver It should interface and isolate the Control Unit/Primary Circuit from the secondary which is directly connected to the high power. Gate Driver controls the IGBT's dynamic behavior and its short circuit protection. Input signal level is 0/15V. Interlocking time between the input signals is 3µs. It monitors the errors: power supply under-voltage (below 13 V), short-circuit between Collector and Emitter. The error reset time is typically 9µs. On detection of error/fault, the Gate Driver switches off the IGBT. The IGBT switching speed may be adjusted by the resistors RGON and RGOFF. The two parameters (Rce, Cce) define the values and time delays for the comparison of an internal reference with the monitored value of Vce(sat).</p> <p>Capacitor & Snubber Rectified DC input is given to electrolytic filtering capacitors. Each capacitor is 4700 µF / 450 V. 2 capacitors are connected in series to have equivalent capacitance of 2350 µF / 900 V. Resistors of value 27 k / 20 W are connected across each capacitor for voltage balancing. Snubber Capacitors of 0.22 µF / 1500 Vdc (4 nos) are connected across the dc link for voltage overshoot protection. The snubbers limit the over-voltages during commutations and as a consequence reduce the losses. They are kept very close to the device to reduce the inductance between the switches and the capacitors.</p> <p>Cooling Teaching kit stack assembly should be provided with forced air cooling. IGBT modules should be mounted on 250 mm heat sink (extruded type). Forced air-cooling should be provided by Hi cool Fan. 230VAC 1ph. should be applied to the Fan input terminals provided on the unit. Flow of air is 3 m/s. Input to the fan is 1-Φ 230 V Supply</p> <p>Thermal Protection Normally Closed Thermal contact switch is used for protection against thermal runaway. The position of the thermal switch normally closed when its temperature is below the threshold temperature (80 deg C) & it changes to normally open above 80 deg C. After cooling down, it again retains it normally closed position. Thermal switch is placed at the warmest point on the heat sink.</p>
4.	<p>AMS Card</p> <p>The Daughter card should be capable of generating required nos. of 15V PWMs. It should also have 8 channels, 16 bit, 1 MSps, 10V bipolar ADCs. Option to use the card with controllers with 3.3V/5V logic levels This card should support Xilinx system generator software with all peripherals directly available as blocksets. Matlab/Simulink blocksets should be provided for ADC's, Sinewave, Carrier wave, comparator, PI controller & commonly used blocks used in drive applications and these should be compatible with system generator.</p>
5.	FPGA Nano Board and Software
	<p>Zynq-7000 AP SoC XC7Z020-CLG484 Dual Core ARM Cortex A9</p> <p>Memory: 512 MB DDR3 and 256 MB Quad-SPI Flash 4 GB SD card Onboard USB-JTAG Programming 10/100/1000 Ethernet USB OTG 2.0 and USB UART. PS & PL I/O (FMC, Pmod™, XADC) Multiple displays (1080p HDMI, 8 bit VGA, 128x32 OLED) I2S Audio</p> <p>These should be provision to attach the AMS card with the FPGA board</p> <p>Software for measurement: Should be able to View & zoom Current (4 channels), Voltage (4 Channels) and all PWMs. The software should be able to record the live data and play it again along with option for mathematical operations on the stored data. It should have Options to export data to Matlab.</p>

6.	LEM based Sensors
	<p>LEM based instantaneous Voltage and current sensors are required for feedback Voltage sensor 0-1000V AC/DC measurement and output should be true value & signal conditioned 0-3.3V DC Current Sensor 0-25 AC/DC measurement and output should be true value & signal conditioned 0-3.3V DC Encoder should be 1024 ppr for Speed Feedback. Below Hall effect sensors required with power supplies: Current Sensors – 4 No. Voltage Sensors – 4 No. Irradiance Sensor -1 No Temperature Sensor- 1 No</p>
7.	Grid Protection
	<p>Dual Layer Protection for Grid Connection Mode a. Programmable protection using specially designed control algorithms in FPGA b. Backup protection using Industrial relays 1. Directional relays for current direction 2. Short Circuit and Over current protection 3. Inverse time overcurrent relays 4. Contactors & Relays for Synchronizing 5. Static transfer Switches</p>
8.	Programmable source as Grid Emulator
	<p>Grid emulators are specially designed to emulate grid disturbances. All range of grid emulators has different programmable parameters that allow flexibility to evaluate different kind of scenarios. They can generate different type of grids and its common faults and disturbances. Grid emulators can be used to study Distributed Energy Resources (DER). In these scenarios, the equipment can vary the capabilities of deliver, consume or store energy from or to the grid.</p> <p>Functional description</p> <p>It should generate different types of grids:</p> <ul style="list-style-type: none"> • Three phase power grid (3F+N) from 0 to 480Vac • Power grid with variable frequency from 40 to 60Hz • DC Voltage Source from 0 - to 600Vdc <p>Usual faults that should be generated:</p> <ul style="list-style-type: none"> • Programmable amplitude and frequency and overvoltage • Generation of interruptions and voltage dips • Three phase power grids with programmable variations in frequency <p>Designed to be easy to use and cost effective in applications that require reliability for reproducing complex scenarios.</p> <p>Generation Controlling the H-Bridges using SPWM/SVPWM/VECTOR any convenient control technique power is generated with desired output (Both amplitude and frequency can be controlled)</p> <p>Voltage Sag/Swell Reducing/Increasing the PWM Duty so that Inverter output Producing Corresponding Sag/Swell for the required time. This can be achieved by modifying the modulation Index in the program manually or automatically with calculated time</p> <p>Open Circuit Fault(Single Phasing) Turning ON/OFF Corresponding phase switches open circuit fault can be generated.</p> <p>Voltage Unbalance By controlling the control signal to each phase independently (for all phases PWM of Different Duty) unbalanced condition can be created.</p> <p>Specs: Input AC Voltage : 0 to 415V DC link Voltage:- 600 Volt O/P AC Voltage:- 415 Volt O/P AC Current:- 14 Amp Switching Frequency:- upto 20 kHz Fundamental Frequency:- 50 Hz Type of Cooling:- Forced Air Ambient Temp:- 40 Deg Duty Class:- Class I Cooling Method Forced Air Cooled.</p> <p>IGBT Details V-IGBT=6. Generation Trench V-IGBT CAL4= Soft switching 4 Generation CAL-diode. Isolated copper baseplate using DCB technology (Direct Copper Bonding). Increased power cycling capability. With integrated gate resistor. Low switching losses at high di/dt.</p>

	<p>Bridge Module Three phase bridge rectifier Blocking voltage of 1600 V High surge current carrying capability Large isolated base plate & Easy mounting</p> <p>Gate Driver It should interface and isolate the Control Unit/Primary Circuit from the secondary which is directly connected to the high power. Gate Driver controls the IGBT's dynamic behavior and its short circuit protection. Input signal level is 0/15V. Interlocking time between the input signals is 3µs. It monitors the errors: power supply under-voltage (below 13 V), short-circuit between Collector and Emitter. The error reset time is typically 9µs. On detection of error/fault, the Gate Driver switches off the IGBT. The IGBT switching speed may be adjusted by the resistors RGON and RGOFF. The two parameters (Rce, Cce) define the values and time delays for the comparison of an internal reference with the monitored value of Vce(sat).</p> <p>Kit Details 3-phase teaching kit consists of 3-phase uncontrolled rectifier and 3-phase IGBT based controlled Inverter. It should also have a brake chopper. 3-phase 415 V input is applied to the uncontrolled rectifier (SKD100/16) using an autotransformer The dc output of the Rectifier is given to the input of the IGBT based inverter. DC capacitor bank is connected in between the rectifier and inverter as source to the inverter. 3 phase 415 V ac Output is achieved from the inverter and is provided for the Motor Interface. Driver is the interface unit between the power module and controller. Each Driver drives 2 switches in a Module. +15V/0V supply is given to Vs and GND. Alternate ON/OFF pulses of +15V are given to Vin1 and Vin2. Vin1 corresponds to TOP IGBT and Vin2 corresponds to BOTTOM IGBT. ERROR is triggered when Vs falls below 13.9 V and Short circuit of IGBT. ERROR output is taken to the controller for turning off the system during occurrence of the error.</p> <p>Capacitor & Snubber Rectified DC input is given to electrolytic filtering capacitors. Each capacitor is 4700 µF / 450 V. 2 capacitors are connected in series to have equivalent capacitance of 2350 µF / 900 V. Resistors of value 27 k / 20 W are connected across each capacitor for voltage balancing. Snubber Capacitors of 0.22 µF / 1500 Vdc (4 nos) are connected across the dc link for voltage overshoot protection. The snubbers limit the over-voltages during commutations and as a consequence reduce the losses. They are kept very close to the device to reduce the inductance between the switches and the capacitors.</p> <p>Cooling Teaching kit stack assembly should be provided with forced air cooling. IGBT modules should be mounted on 250 mm heat sink (extruded type). Forced air-cooling should be provided by Hi cool Fan. 230VAC 1ph. should be applied to the Fan input terminals provided on the unit. Flow of air is 3 m/s. Input to the fan is 1-Φ 230 V Supply</p> <p>Thermal Protection Normally Closed Thermal contact switch is used for protection against thermal runaway. The position of the thermal switch normally closed when its temperature is below the threshold temperature (80 deg C) & it changes to normally open above 80 deg C. After cooling down, it again retains it normally closed position. Thermal switch is placed at the warmest point on the heat sink.</p>
	<p>PWM Card</p>
	<p>Additional card should be provided which can take 3.3V/5V from any controller and deliver required nos. of 15 V PWM to the IGBT stack. Required 15V, 4A regulated power supply should be included.</p>
	<p>Load for Islanding</p>
	<p>2 HP induction motor with mechanical loading arrangement and three phase R load</p>
	<p>Cables</p>
	<p>All the cables should be multicore shielded cable for EMC</p>
	<p>Installation & training</p>
	<p>Three days onsite installation and training</p>
	<p>The system should support the following: Solar module with MPPT algorithm and adaptive control for emulated grid The R Load and the motor load will act as the load and islanding option has to be provided.</p>

**TECHNICAL COMPLIANCE OF "Lab Equipments"
(ON THE LETTER HEAD OF THE BIDDER)**

	Description of Items	Whether meet the requirement(Yes/No)	Quoted Models Specifications
	Lab Equipments (Detailed specifications attached at Annexure-B)		
1.	Solar Panel along with junction box, 30m cable and mounting arrangement for 1000 W its not inbuilt		
2.	Three Phase Fully controlled IGBTs based Voltage source inverter		
3.	Boost Converter with Inductor		
4.	Analog Mixed signal card for FPGA board along with power supply. AMS card with 1 No 15V DC power Supply contains Inbuilt Two 4- channel ADCs, 16bit, 1 MSPS, 10V, bipolar & PWM Two 4-channels, 15V		
5.	FPGA Nano Board with Xilinx FPGA		
6.	LEM based Current and voltage Sensors with inbuilt signal conditioning & power supplies Hall effect sensors: Current Sensors – 3 Nos.; Voltage Sensors – 7 Nos.; Zero Crossing detector – 2 Nos.; Irradiance Sensor -1 No.; Temperature Sensor- 1 No.		
7.	Dual Layer Protection for Grid Connection Modes: 1. Programmable protection using specially designed control algorithms in FPGA 2. Backup protection using Industrial relays 3. Directional relays for current direction 4. Short Circuit and Over current protection 5. Inverse time over current relays 6. Contactors for Synchronizing 7. Static Transfer Switch 8. Relays and Contactors		
8.	Programmable Source as Grid Emulator		
9.	Connecting Cables (PVC Insulated and shielded made for EMI protection)		
10.	Spare parts/ICs /Discrete components/Printed Circuit Board(PCB), Miniature Circuit Breaker		

ANNEXURE-D

PROFORMA FOR DIRECT PAYMENT/TRANSFER TO BANK ACCOUNT BY MNNIT ALLAHABAD

Sl. No.	Particulars	Information
1.	Firm [Beneficiary] Name	
2.	Code No. allotted by the MNNIT Allahabad [If code is not allotted yet, please enclose a cancelled cheque and copy of PAN card. Cancelled cheque & PAN card is to be submitted only once]	
3.	Complete Bank Account No. of the Firm [beneficiary]. [in case of change in bank account vendor should write to Account Office]	
4.	Bank Name	
5.	Branch Address	
6.	IFSC Code No.	
7.	Permanent Account Number	
8.	Mobile No. [for SMS]	
9.	Email ID [for information]	

We undertake that all information provided above is correct and MNNIT Allahabad will not be responsible in case of any error on the part of firm.

[Seal and Signature of the firm]

PRICE BID
(ON THE LETTER HEAD OF THE BIDDER)

Sl. No.	Brief Description of the Goods	Quantity	Quoted Unit Rate in Rs	Total Amount (in Rs.)		Tax	
				In Figures	In Words	VAT	Any other charges (if any)
	Lab Equipments (Detailed Specification attached at 'Annexure-B')						
1.	Solar Panel along with junction box, 30m cable and mounting arrangement for 1000 W its not inbuilt	1 No.					
2.	Three Phase Fully controlled IGBTs based Voltage source inverter	1 No.					
3.	Boost Converter with Inductor	1 No.					
4.	Analog Mixed signal card for FPGA board along with power supply. AMS card with 1 No 15V DC power Supply contains Inbuilt Two 4- channel ADCs, 16bit, 1 MSPS, 10V, bipolar & PWM Two 4-channels, 15V	1 No.					
5.	FPGA Nano Board with Xilinx FPGA	1 No.					
6.	LEM based Current and voltage Sensors with inbuilt signal conditioning & power supplies Hall effect sensors: Current Sensors – 3 Nos.; Voltage Sensors – 7 Nos.; Zero Crossing detector – 2 Nos.; Irradiance Sensor -1 No.; Temperature Sensor- 1 No.	-					
7.	Dual Layer Protection for Grid Connection Modes: 1. Programmable protection using specially designed control algorithms in FPGA 2. Backup protection using Industrial relays 3. Directional relays for current direction 4. Short Circuit and Over current protection 5. Inverse time over current relays 6. Contactors for Synchronizing 7. Static Transfer Switch 8. Relays and Contactors	1 set					
8.	Programmable Source as Grid Emulator	1 No.					
9.	Connecting Cables (PVC Insulated and shielded made for EMI protection)	1 No.					
10.	Spare parts/ICs /Discrete components/Printed Circuit Board(PCB), Miniature Circuit Breaker	1 No.					

We agree to supply the above goods in accordance with the technical specifications for a total contract price of _____ within the period specified in the Invitation for Quotations.

Signature and Seal of the Manufacturer/Bidder