**Indira Gandhi Engineering College, Sagar,Jabalpur Road, Baheriya**
**Gadgad, Near Makronia Railway Station, Sagar – 470021**
**Email Id – prinigec.sgr@mp.gov.in**

# INVITATION FOR QUOTATION

**Package Code: TEQIP-III/2019/MP/igec/66** 3219 26/09/2019 **Current Date: 23-Sep-2019**
**Package Name: IGEC/EE/ED-2/EQIP/01 to 11** **Method: Shopping Goods**

**For uploading on the Institute Website**
**Subject: INVITATION FOR QUOTATION FOR SUPPLY OF GOODS**

Dear Sir,

1. You are invited to submit your most competitive quotation for the following goods with item wise detailed specifications given at Annexure I,

| Sr. No | Item Name | Quantity | Place of Delivery | Installation Requirement (if any) |
|---|---|---|---|---|
| 1. | Setup for Speed control of single phase induction motor | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 2. | Setup for IGBT Chopper based speed control of separately excited DC Motor | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 3. | Speed control of separately excited DC motor using single phase half and fully controlled converter | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 4. | Setup for study of four quadrant operation of chopper drive | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 5. | Setup for 3- Phase Induction Motor Speed Control Using V/F Control | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 6. | Setup for Static Rotor Resistance control of Three Phase Slip Ring Induction Motor | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 7. | Set up for static KRAMER Drive | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 8. | Speed control of separately excited DC motor using Three phase half and fully controlled converter | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 9. | Set up for SRM Drive | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 10. | 3-phase Electrical Power Distribution Panel (415V, 100A, 50Hz) | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |
| 11. | Itemwise Cabling of motors and panel, Cabling and earthing of panels and motors | 1 | EE Department, I.G. Engineering College, Sagar | Installation should be done free of cost. |

2. Government of India has received a credit from the International Development Association (IDA) towards the cost of the **Technical Education Quality Improvement Programme |TEQIP|-Phase III** Project and intends to apply part of the proceeds of this credit to eligible payments under the contract for which this invitation for quotations is issued.
3. **Quotation**
   - 3.1 The contract shall be for the full quantity as described above.
   - 3.2 Corrections, if any, shall be made by crossing out, initialling, dating and re writing.
   - 3.3 All duties and other levies payable by the supplier under the contract shall be included in the unit Price.
   - 3.4 Applicable taxes shall be quoted separately for all items.
   - 3.5 The prices quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.
   - 3.6 The Prices should be quoted in Indian Rupees only.
4. Each bidder shall submit only one quotation.
5. Quotation shall remain valid for a period not less than **90** days after the last date of quotation submission.
6. Evaluation of Quotations: The Purchaser will evaluate and compare the quotations determined to be Substantially responsive, i.e., which
   - 6.1 are properly signed; and
   - 6.2 Confirm to the terms and conditions, and specifications.
7. The Quotations would be evaluated for all items together.
8. 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.

O/C

8.1 Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to can bidding process and reject all quotations at any time prior to the award of Contract.

8.2 The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expirati the quotation validity period. The terms of the accepted offer shall be incorporated in the purchase order.

9. Payment shall be made in Indian Rupees as follows:

| Payment Description | Expected Delivery Period (in Days) | Payment Percentage |
|---|---|---|
| Satisfactory Delivery, Acceptance, Installation & Testing | 30 | 100 |

10. Liquidated Damages will be applied as per the below:

Liquidated Damages Per Day Min % : N/A
Liquidated Damages Max % : N/A

11. All supplied items are under warranty of **24** months from the date of successful acceptance of items and AMC/Others is **No**.
12. You are requested to provide your offer latest by **15:00** hours on **10-Oct-2019.**
13. Detailed specifications of the items are at Annexure I.
14. Training Clause (if any) – **Training on operation and handling of equipments free of cost as per department requirements.**
15. Testing/Installation Clause (if any) – **Full installation and testing/demonstration free of cost.**
16. Performance Security shall be applicable**: 0%**
17. Information brochures/ Product catalogue, if any must be accompanied with the quotation clearly indicating the model quoted for.
18. Sealed quotation to be submitted/ delivered at the address mentioned below, **Indira Gandhi Engineering College, Sagar, Jabalpur Road, Baheriya Gadgad, Near Makronia Railway Station, Sagar – 470021**
19. **Qualification Criteria** : The bidder/supplier should have :

19.1 A minimum of 3 years experience of supplying similar items.

19.2 A turnover of Rs. 100 lakhs at least once in three years.

19.3 Not been blacklisted by any Government Institution/Organization.

20. The quotation should include the following information :

20.1 The copies of original documents defining the constitution or legal status, place of registration and principal place of business of the company firm or partnership etc. in India.

20.2 Report on financial status (balance sheet and auditor's report for the past three years).

20.3 An affidavit for not being blacklisted by any Government Institution/Organization.

20.4 Authorization Certificate from the OEM/Principal (if bidder/supplier is not an OEM) assuring full guarantee and warranty obligations during the liability period, for the goods offered.

20.5 The list of clients duly supported by copies of purchase orders, installation and performance report signed by purchasers/users.

21. In case of failure to supply the goods within the prescribed time and in accordance with the specifications given in the contract/purchase order, the institute shall be free to cancel the order and make purchase from the next higher tenderer/from the open market as the case may be.
22. The competent authority reserves the right to increase or decrease the quantity of any item of sale, during the period of contract. The tenderer/bidder will be bound to comply with the order of the competent authority without any claim and compensation.
23. Any controversy will be subject to disposal in Sagar Jurisdiction only.
24. Damaged, defective or substandard material will not be accepted under any circumstances.
25. Preference will be given to :

25.1 The bidders possessing relevant certification by an authorized body such as ISO etc., copy of which must be enclosed.

25.2 The bidders that have quoted the item certified for standard, quality and safety such as BIS, ISI etc., copies of which must be enclosed.

26. Please mention following on top of the sealed quotation submission envelope –

26.1. TEQIP – III
26.2 Package Code
26.3 Don't open before 03:00 PM on 10 Oct, 2019.

27. We look forward to receiving your quotation and thank you for your interest in this project.

(Authorized Signatory)
Name & Designation

## Annexure I

| Sr. No | Item Name | Specifications |
|---|---|---|
| 1 | Setup for Speed control of single phase induction motor | **Setup for Speed control of single phase induction motor** This set up consists of Microcontroller based PWM Controller, IGBT Based Voltage source inverter Power Module, 1Ø AC Motor set up. Microcontroller based PWM Controller PWM controller designed should be based on Dspic30f4011 controller chip specially designed for Power Electronics & Motor control applications from "MICROCHIP" company and this controller can be used to generate PWM Signals for SCR, IGBT based power electronics application like DC-AC Inverter, DC-DC Chopper & SCR converter based AC/DC/BLDC Switched Reluctance Motor (SRM) control application. PWM output of this controller can be directly interfaced with Power Module through External cable connection. Features: Includes High-Performance Microchip dsPIC30F4011 Micro- controller with 48kb Internal Flash Program Memory, 6 Numbers of PWM Outputs up to 15KHZ of switching frequency, RS232 Connection with MAX232, Internal EEPROM, Five 16-bit Timers, Power, Programming and Test LED's, 2MB PROM & 24 MHz clock speed, USB – PGM Downloader, 6 Numbers of ADC input, QEP Sensor /Hall sensor/Speed sensor(Proximity)Interface, PWM increment & decrement key, Reset switch & LED's for Sensor status, 20 X 4 LCD screen, PWM outputs are terminated by 34 pin FRC Connector USB Based Program downloader: One number of USB based program downloader should be provided for developed new program downloading to this controller. IGBT power module (Voltage source Inverter): IGBT based Smart Power Module (SPM) from "FAIRCHILD SEMICONDUCTORS" for AC/DC Motor control application. This power module can be used for AC, DC, BLDC, PMSM Motor application by proper external PWM controller interfacing (like Dspic, FPGA & DSP). Module should consists of : IGBT 1 no. of SPM-Smart Power Module (Model FSBB20CH60B) Rating @ 600V, 20A based Voltage source inverter Power circuit, SPM-IGBT is fixed with suitable heat sink and snubber circuit for protection, IGBT Power circuit input and outputs are terminated by suitable rating banana connectors in front panel with necessary indication. DIODE RECTIFIER 1 no. of diode rectifier (600V @ 35A) is provided to converter input AC voltage to DC Bus voltage, DC Capacitor is provided (centre point type) at diode rectifier output side for Filter, Analogue DC Voltmeter is provided to measure DC Bus voltage. PWM ISOLATOR 6 nos. of PWM Isolator IC (6N137) is used to isolate All the six PWM signals input, 1 no. of +15V@1amp fixed dc power supply is provided for PWM Isolator input side for power excitation, 1 no. of +5V@1amp fixed dc power supply is provided for PWM Isolator Output side power excitation. PWM Driver Built in IGBT Gate Driver is provided in SPM for IGBT Gate signal amplification. SENSORS 3 nos. of Hall effect current sensor @ 25A is provided for 3Ø output AC/DC Current measurement, 1 no. of Hall effect current sensor @ 25A is provided for Input DC bus Current measurement, Op-Amp based Signal conditioner circuits are provided in all sensors for output current signals amplifications, All current sensor signal conditioner circuit outputs are terminated in front panel by suitable connectors. PROTECTION CIRCUIT 1 no. of automatic trip circuit is provided for O/C protection, LED is provided for trip status indication, Reset switch is provided for TRIP RESET. CONNECTORS 1 no. of 34 pin FRC Connector is provided for PWM input signal input and feedback, Banana connectors are provided for AC input, Banana connectors are provided for 3 phase output, Test points are provided for PWM signal and Current wave form measurements, MCB is provided at input side for Input supply ON/OFF. SPECIFICATIONS Power Circuit Input : 0-230VAC , 50 HZ (or) 0-300VDC, Output : 3 Ø 200V @ 5A, Variable Voltage, Variable frequency (OR) 0 +/- 280VDC PWM Section Number of PWM Input : 6, Maximum PWM Frequency : 15KHZ, PWM Level : 0-5V (TTL). 1Ø AC Motor set up with speed feedback sensor Type : 1Ø Squirrel Cage Induction Motor, Power : 1 HP, Voltage : 200V, Speed : 1415rpm, Feedback sensor : Proximity sensor, Loading arrangement Spring balance type loading arrangement with dial indication |

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| 2 | Setup for IGBT Chopper based speed control of separately excited DC Motor | **Setup for IGBT Chopper based speed control of separately excited DC Motor** This set up should consists of Microcontroller based PWM Controller, IGBT Based Voltage source inverter Power Module, 1HP DC Shunt Motor set up. Microcontroller based PWM Controller PWM controller designed based on Dspic30f4011 controller chip specially designed for Power Electronics & Motor control applications from "MICROCHIP" company and this controller can be used to generate PWM Signals for SCR, IGBT based power electronics application like DC-AC Inverter, DC-DC Chopper & SCR converter based AC/DC/BLDC Switched Reluctance Motor (SRM) control application. PWM output of this controller can be directly interfaced with Power Module through External cable connection. Features Includes High-Performance Microchip dsPIC30F4011 Micro-controller with 48kb Internal Flash Program Memory, 6 nos. of PWM Outputs up to 15KHZ of switching frequency, RS232 Connection with MAX232, Internal EEPROM, 5 16-bit Timers, Power, Programming and Test LED's, 2MB PROM & 24 MHz clock speed, USB - PGM Down loader, 6 nos. of ADC input, QEP Sensor /Hall sensor/Speed sensor(Proximity)Interface, PWM increment & decrement key, Reset switch & LED's for Sensor status, 20 X 4 LCD screen, PWM outputs are terminated by 34 pin FRC Connector. USB Based Program downloader 1 no. of USB based program downloader should be provided for developed new program downloading to this controller. IGBT power module (Voltage source Inverter): Module designed by using IGBT based Smart Power Module (SPM) from "FAIRCHILD SEMICONDUCTORS" for AC/DC Motor control application. This power module can be used for AC, DC, BLDC, PMSM Motor application by proper external PWM controller interfacing (like Dspic, FPGA & DSP). This Module consists of IGBT 1 no. of SPM-Smart Power Module (Model FSBB20CH60B) Rating @ 600V , 20A based Voltage source inverter Power circuit, SPM-IGBT is fixed with suitable heat sink and snubber circuit for protection, IGBT Power circuit input and outputs are terminated by suitable rating banana connectors in front panel with necessary indication. DIODE RECTIFIER 1 no. of diode rectifier ( 600V @ 35A ) is provided to converter input AC voltage to DC Bus voltage, DC Capacitor is provided ( centre point type) at diode rectifier output side for Filter, Analogue DC Voltmeter is provided to measure DC Bus voltage. PWM ISOLATOR 6 nos. of PWM Isolator IC (6N137) is used to isolate All the six PWM signals input, 1 no. of +15V@1amp fixed dc power supply is provided for PWM Isolator input side for power excitation, 1 no. of +5V@1amp fixed dc power supply is provided for PWM Isolator Output side power excitation. PWM Driver Built in IGBT Gate Driver is provided in SPM for IGBT Gate signal amplification. SENSORS 3 nos. of Hall effect current sensor @ 25A is provided for 3Ø output AC/DC Current measurement, 1 no. of Hall effect current sensor @ 25A is provided for Input DC bus Current measurement, Op-Amp based Signal conditioner circuits are provided in all sensors for output current signals amplifications, all current sensor signal conditioner circuit outputs are terminated in front panel by suitable connectors PROTECTION CIRCUIT 1 no. of automatic trip circuit is provided for O/C protection, LED is provided for trip status indication, Reset switch is provided for TRIP RESET. CONNECTORS 1 no. of 34 pin FRC Connector is provided for PWM input signal input and feedback, Banana connectors are provided for AC input, Banana connectors are provided for 3 phase output, Test points are provided for PWM signal and Current wave form measurements, MCB is provided at input side for Input supply ON/OFF. SPECIFICATION Power Circuit Input : 0-230VAC , 50 HZ (or) 0-300VDC, Output : 3 Ø 200V @ 5A ,Variable Voltage, Variable frequency (OR) 0 +/- 280VDC. PWM Section Number of PWM Input : 6, Maximum PWM Frequency : 15KHZ, PWM Level : 0-5V (TTL) DC Shunt Motor with load set up Type : DC Shunt Motor, Power : 1 HP, Voltage : 200Vdc for Armature & Field, Speed : 1500 RPM, Feedback sensor : Proximity sensor, Loading : Spring balance loading Spring balance Loading 1 no. Brake DRUM with spring balance set up is coupled with the above motor, 2 nos. of dial indication for load in Kg measurement, all are mounted on a powder coated mechanical set up. |

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| 3 | Speed control of separately excited DC motor using single phase half and fully controlled converter | **Speed control of separately excited DC motor using single phase half and fully controlled converter**<br>This set up consists of Microcontroller based PWM Controller, Single Phase SCR Power Module, 1HP DC Shunt Motor set up. Microcontroller based PWM Controller This PWM controller is designed based on Dspic30f4011 controller chip specially designed for Power Electronics & Motor control applications from "MICROCHIP" company and this controller can be used to generate PWM Signals for SCR, IGBT based power electronics application like DC-AC Inverter ,DC-DC Chopper & SCR converter based AC/DC/BLDC Switched Reluctance Motor (SRM) control application. PWM output of this controller can be directly interfaced with Power Module through External cable connection. Features Includes High-Performance Microchip dsPIC30F4011 Micro-controller with 48kb Internal Flash Program Memory, 6 nos. of PWM Outputs up to 15KHZ of switching frequency, RS232 Connection with MAX232, Internal EEPROM, 5 16-bit Timers, Power, Programming and Test LED's, 2MB PROM & 24 MHz clock speed, USB - PGM Down loader, 6 nos. of ADC input, QEP Sensor/ Hall sensor/ Speed sensor(Proximity)Interface, PWM increment & decrement key, Reset switch & LED's for Sensor status, 20 X 4 LCD screen, PWM outputs are terminated by 34 pin FRC Connector. USB Based Program downloader One number of USB based program downloader is provided for developed new program downloading to this controller. 1Ø SCR POWER MODULE This power module is designed by using SCR & DIODE for AC-DC Controlled Converter applications. This power module can be used for DC Motor open loop & closed loop speed control application by external PWM controller interfacing. It consists of SCR based Half & Fully Controlled Converter, 4 nos. of SCR, Ratings @ 1200V @ 25A, fixed With proper heat sink for cooling and Snubber circuit, 2 nos. of Diode ( 35A , 1200V) with With proper heat sink for cooling and Snubber circuit, 4 nos. of Pulse amplifier & 1;1 Pulse transformer for all pulse isolation, 1 no. of 230/9V Supply synchronizing transformer & ZCD Circuit is provided for SCR Pulse generation, MCB provided for input power ON/OFF, SCR &Diode outputs and AC inputs are terminated in banana connector. Specifications Input- 230VAC, Output – 0-200V AC/DC @ 5A , Suitable for RL load & Motor Control applications DC Shunt Motor with load set up Type : DC Shunt Motor, Power : 1 HP, Voltage : 200Vdc for Armature & Field, Speed : 1500 RPM, Feedback sensor : Proximity sensor, Loading : spring balance loading Spring balance Loading 1 no. Brake DRUM with spring balance set up is coupled with the above motor, 2 nos. of dial indication for Load in Kg measurement. All are mounted on a powder coated mechanical set up. |
| 4 | Setup for study of four quadrant operation of chopper drive | **Setup for study of four quadrant operation of chopper drive**<br>Items Required: Instrumentation Power supply cum Multichannel DPM panel, 4 IGBT/MOSFET power & sensing panel, Voltmeter & Ammeter panel, PMDC Motor, Lamp Load Detailed Specification of the item required: Instrumentation Power supply cum Multichannel DPM panel- ±12V/500 mA, +5V/300mA, Unregulated 17V dc/750 mA, line synchronizing signal, 13V / 3 Amp, Multichannel DPM for digital display of parameters, 20 pin FRC power bus to supply power to neighboring panel. 4 IGBT/MOSFET power & sensing panel: 1200V/40A IGBT with isolated (LV) TTL compatible isolated driver circuit & individual heat sink 4 nos., Current measurement DC (2 nos.) 0.5E/5W series resistor default or using optionally hall sensors (Max I/P up to 20A, 50/60Hz), isolation up to 2KV, O/P=0-3V for controller feedback, Voltage measurement DC (1 no.) MC DC meter / ammeter default or optionally using hall sensor (Max I/P10-500V, 50/60Hz), isolation up to 2KV, O/P=0-3V for controller feedback, IC3525 based PWM control with variable duty cycle (5%-90%) & variable frequency (1- 20KHz) Power supplies isolated 2 nos. 24V@3A& 12V@750mA with loading resistors provided to prevent voltage built up, A panel consisting of diode bridge (1000V/35A), capacitors (0.1 & 2.5µF) & resistors (0.5E/5W & 5E/20W). Voltmeter & Ammeter panel: (300V-0-300V) & Ammeter (2A-0-2A) , ( 30V- 0-30V) & Ammeter (2A-0-2A). PMDC Motor Specifications: 220V/200W/2000RPM Chasis mounted table top with spring balance loading arrangement (Wt.-10Kg) 10V/1000RPM. Lamp Loads: 230V /15/40/60/100W X 3 bulbs with individual ON/OFF using 6A toggle switch. |

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| 5 | Setup for 3- Phase Induction Motor Speed Control Using V/F Control | **Setup for 3- Phase Induction Motor Speed Control Using V/F Control** This set up consists of Microcontroller based PWM Controller, IGBT Based Voltage source inverter Power Module, 3Ø AC Motor set up. Microcontroller based PWM Controller This PWM controller is designed based on Dspic30f4011 controller chip specially designed for Power Electronics & Motor control applications from "MICROCHIP" company and this controller can be used to generate PWM Signals for SCR, IGBT based power electronics application like DC-AC Inverter ,DC-DC Chopper & SCR converter based AC/DC/BLDC Switched Reluctance Motor (SRM) control application. PWM output of this controller can be directly interfaced with Power Module through External cable connection. Features Includes High-Performance Microchip dsPIC30F4011 Micro-controller with 48kb Internal Flash Program Memory, 6 nos. of PWM Outputs up to 15KHZ of switching frequency, RS232 Connection with MAX232, Internal EEPROM, 5 16-bit Timers, Power, Programming and Test LED's, 2MB PROM & 24 MHz clock speed, USB - PGM Down loader, 6 nos. of ADC input, QEP Sensor/ Hall sensor/ Speed sensor(Proximity)Interface, PWM increment & decrement key, Reset switch & LED's for Sensor status, 20 X 4 LCD screen, PWM outputs are terminated by 34 pin FRC Connector USB Based Program downloader 1 no. of USB based program downloader is provided for developed new program downloading to this controller. IGBT power module (Voltage source Inverter) This power module is designed by using IGBT based Smart Power Module (SPM) from "FAIRCHILD SEMICONDUCTORS" for AC/DC Motor control application. This power module can be used for AC, DC, BLDC, PMSM Motor application by proper external PWM controller interfacing (like Dspic, FPGA & DSP). This Module consists of IGBT 1 no. of SPM-Smart Power Module ( Model FSBB20CH60B ) Rating @ 600V, 20A based Voltage source inverter Power circuit, SPM-IGBT is fixed with suitable heat sink and snubber circuit for protection, IGBT Power circuit input and outputs are terminated by suitable rating banana connectors in front panel with necessary indication. DIODE RECTIFIER 1 no. of diode rectifier ( 600V @ 35A ) is provided to converter input AC voltage to DC Bus voltage, DC Capacitor is provided ( centre point type) at diode rectifier output side for Filter, Analogue DC Voltmeter is provided to measure DC Bus voltage. PWM ISOLATOR 6 nos. of PWM Isolator IC (6N137) is used to isolate All the six PWM signals input, 1 no. of +15V@1amp fixed dc power supply is provided for PWM Isolator input side for power excitation, 1 no. of +5V@1amp fixed dc power supply is provided for PWM Isolator Output side power excitation. PWM Driver Built in IGBT Gate Driver is provided in SPM for IGBT Gate signal amplification. SENSORS 3 nos. of Hall effect current sensor @ 25A is provided for 3Ø output AC/DC Current measurement, 1 no. of Hall effect current sensor @ 25A is provided for Input DC bus Current measurement, Op-Amp based Signal conditioner circuits are provided in all sensors for output current signals amplifications, All current sensor signal conditioner circuit outputs are terminated in front panel by suitable connectors. PROTECTION CIRCUIT 1 no. of automatic trip circuit is provided for O/C protection, LED is provided for trip status indication, Reset switch is provided for TRIP RESET. CONNECTORS 1 no. of 34 pin FRC Connector is provided for PWM input signal input and feedback, Banana connectors are provided for AC input, Banana connectors are provided for 3 phase output, Test points are provided for PWM signal and Current wave form measurements, MCB is provided at input side for Input supply ON/OFF. SPECIFICATION Power Circuit Input : 0-230VAC , 50 HZ (or) 0-300VDC, Output : 3 Ø 200V @ 5A, Variable Voltage , Variable frequency ( OR) 0 +/- 280VDC. PWM Section Number of PWM Input : 6, Maximum PWM Frequency : 15KHZ, PWM Level : 0-5V (TTL) 3Ø AC Motor set up with speed feedback sensor: Type : 3Ø Squirrel Cage Induction Motor, Power : 1 HP, Voltage : 415/200V, Speed : 1415rpm, Feedback sensor : Proximity sensor, Loading arrangement : Spring balance type loading arrangement with dial indication. |
| 6 | Setup for Static Rotor Resistance control of Three Phase Slip Ring Induction Motor | **Setup for Static Rotor Resistance control of Three Phase Slip Ring Induction Motor** - This set up consists of Microcontroller based PWM Controller, IGBT Based Voltage source inverter Power Module, 1HP, 3Ø Slip Ring Induction Motor set up, 1KW, 3Ø Loading Rheostat. Microcontroller based PWM Controller PWM controller design based on Dspic30f4011 controller chip specially designed for Power |

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| | | Electronics & Motor control applications from "MICROCHIP" company and this controller can be used to generate PWM Signals for SCR, IGBT based power electronics application like DC-AC Inverter ,DC-DC Chopper & SCR converter based AC/DC/BLDC Switched Reluctance Motor (SRM) control application. PWM output of this controller can be directly interfaced with Power Module through External cable connection. Features Includes High-Performance Microchip dsPIC30F4011 Microcontroller with 48kb Internal Flash Program Memory, 6 nos. of PWM Outputs up to 15KHZ of switching frequency, RS232 Connection with MAX232, Internal EEPROM, 5 16-bit Timers, Power, Programming and Test LED's, 2MB PROM & 24 MHz clock speed, USB - PGM Down loader, 6 nos. of ADC input, QEP Sensor/ Hall sensor/ Speed sensor (Proximity) Interface, PWM increment & decrement key, Reset switch & LED's for Sensor status, 20 X 4 LCD screen, PWM outputs are terminated by 34 pin FRC Connector. USB Based Program downloader One number of USB based program downloader is provided for developed new program downloading to this controller. IGBT power module (Voltage source Inverter) Power module should be designed by using IGBT based Smart Power Module (SPM) from "FAIRCHILD SEMICONDUCTORS" for AC/DC Motor control application. This power module can be used for AC, DC, BLDC, PMSM Motor application by proper external PWM controller interfacing (like Dspic FPGA & DSP). Module consists of: IGBT 1 no. of SPM-Smart Power Module (Model FSBB20CH60B) Rating @ 600V , 20A based Voltage source inverter Power circuit, SPM-IGBT is fixed with suitable heat sink and snubber circuit for protection, IGBT Power circuit input and outputs are terminated by suitable rating banana connectors in front panel with necessary indication. DIODE RECTIFIER 1 no. of diode rectifier (600V @ 35A) is provided to converter input AC voltage to DC Bus voltage, DC Capacitor is provided (centre point type) at diode rectifier output side for Filter, Analogue DC Voltmeter is provided to measure DC Bus voltage. PWM ISOLATOR 6 nos. of PWM Isolator IC (6N137) is used to isolate All the six PWM signals input, 1 no. of +15V@1amp fixed dc power supply is provided for PWM Isolator input side for power excitation, 1 no. of +5V@1amp fixed dc power supply is provided for PWM Isolator Output side power excitation. PWM Driver Built in IGBT Gate Driver is provided in SPM for IGBT Gate signal amplification. SENSORS 3 nos. of Hall effect current sensor @ 25A is provided for 3Ø output AC/DC Current measurement , 1 no. of Hall effect current sensor @ 25A is provided for Input DC bus Current measurement, Op-Amp based Signal conditioner circuits are provided in all sensors for output current signals amplifications, all current sensor signal conditioner circuit outputs are terminated in front panel by suitable connectors. PROTECTION CIRCUIT 1 no. of automatic trip circuit is provided for O/C protection, LED is provided for trip status indication, Reset switch is provided for TRIP RESET. CONNECTORS 1 no. of 34 pin FRC Connector is provided for PWM input signal input and feedback, Banana connectors are provided for AC input, Banana connectors are provided for 3 phase output, Test points are provided for PWM signal and Current wave form measurements, MCB is provided at input side for Input supply ON/OFF. SPECIFICATION Power Circuit Input : 0-230VAC , 50 HZ (or) 0-300VDC, Output : 3 Ø 200V @ 5A , Variable Voltage, Variable frequency ( OR) 0 +/-280VDC. PWM Section Number of PWM Input : 6, Maximum PWM Frequency : 15KHZ, PWM Level : 0-5V (TTL). 3Ø AC Motor set up with speed feedback sensor Type : 3Ø Slip Ring Induction Motor, Power : 1 HP, Voltage : 415/200V, Speed : 1415rpm, Feedback sensor : Proximity sensor, Loading arrangement : Spring balance type loading arrangement with dial indication. |
| 7 | Set up for static KRAMER Drive | **Set up for static KRAMER Drive**<br>1 HP Slip ring Induction Motor with spring balance load set up Type : 3 Phase Slip ring induction motor, Power : 1 HP (750W), Stator Voltage : 3 phase, 415VAC, Rotor Voltage : 3 phase, 200VAC, Speed : 1500 RPM, Loading : Spring balance type loading with dial indication for load measurement in Kg, Sensor : Speed sensor for motor RPM Indication Rotor side converter This diode based 3 phase converter is used to convert slip ring induction motor - rotor side 3 phase ac supply to dc voltage. This dc voltage is fed in to SCR converter section it consists of 1 no. of 3 phase diode full bridge rectifier is provided as rotor side converter, 1200V, 60A Capacity, With |

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| | | necessary heat sink & fuse protection. SCR Converter power circuit with dspic based Firing angle controller This 3 phase SCR converter power module can be used for Static Kramer drive system by external PWM controller interfacing from dspic based firing angle controller (180-90 degree), SCR based 3 phase Fully Controlled bridge power circuit, Six numbers of SCR, Ratings @ 1200V @ 50A, fixed With proper heat sink for cooling and Snubber circuit. 2 nos. of Diode ( 35A , 1200V) with proper heat sink for cooling and Snubber circuit, 6 nos. of Pulse amplifier & 1:1 Pulse transformer for all pulse isolation, 1 no. of 415/9V Supply synchronizing transformer & ZCD Circuit is provided for SCR Pulse generation, MCB provided for input power ON/OFF, SCR &Diode outputs and AC inputs are terminated in banana connector. Specifications Input- 3 phase 0-415VAC, Output – 0-600V DC @ 25A. Microcontroller based PWM Controller This PWM controller should be designed based on Dspic30f4011 controller chip specially designed for Power Electronics & Motor control applications from "MICROCHIP" company and this controller can be used to generate PWM Signals for SCR, IGBT based power electronics application like DC-AC Inverter ,DC-DC Chopper & SCR converter based AC/DC/BLDC Switched Reluctance Motor (SRM) control application. PWM output of this controller can be directly interfaced with Power Module through External cable connection. Features Includes High-Performance Microchip dsPIC30F4011 Microcontroller with 48kb Internal Flash Program Memory, 6 nos. of PWM Outputs up to 15KHZ of switching frequency, RS232 Connection with MAX232, Internal EEPROM, 5 16-bit Timers, Power, Programming and Test LED's, 2MB PROM & 24 MHz clock speed, USB - PGM Down loader, 6 nos. of ADC input, QEP Sensor/ Hall sensor/ Speed sensor (Proximity) Interface, PWM increment & decrement key, Reset switch & LED's for Sensor status, 20 X 4 LCD screen, PWM outputs are terminated by 34 pin FRC Connector. USB Based Program downloader 1 no. of USB based program downloader is provided for PGM Downloading. Power inductor with 3phase transformer 1 no. of Power Inductor is provided as dc link inductor, 100m H, with different toppings, 10A Capacity, Iron core -50HZ operation, 1 no. of 3 phase transformer is provided supply feedback transformer. Specifications Input : 3 phase 230-230-230VAC, Output : 3Phase 110-110-110VAC, Power : 2 KVA Accessories 1 no. of three phase Autotransformer - 2KVA is provided for feedback transformer input. Digital Meter set up Digital Wattmeter is provided for SRIM Stator, rotor & supply side power measurement, Digital Ammeter is provided for dc side current measurement. |
| 8 | Speed control of separately excited DC motor using Three phase half and fully controlled converter | **Speed control of separately excited DC motor using Three phase half and fully controlled converter**<br>This set up consists of Microcontroller based PWM Controller, Three Phase SCR Power Module, 1HP DC Shunt Motor set up. Microcontroller based PWM Controller This PWM controller is designed based on Dspic30f4011 controller chip specially designed for Power Electronics & Motor control applications from "MICROCHIP" company and this controller can be used to generate PWM Signals for SCR, IGBT based power electronics application like DC-AC Inverter ,DC-DC Chopper & SCR converter based AC/DC/BLDC Switched Reluctance Motor (SRM) control application. PWM output of this controller can be directly interfaced with Power Module through External cable connection. Features Includes High-Performance Microchip dsPIC30F4011 Microcontroller with 48kb Internal Flash Program Memory, 6 nos. of PWM Outputs up to 15KHZ of switching frequency, RS232 Connection with MAX232, Internal EEPROM, 5 16-bit Timers, Power, Programming and Test LED's, 2MB PROM & 24 MHz clock speed, USB - PGM Down loader, 6 nos. of ADC input, QEP Sensor/ Hall sensor/ Speed sensor (Proximity) Interface, PWM increment & decrement key, Reset switch & LED's for Sensor status, 20 X 4 LCD screen, PWM outputs are terminated by 34 pin FRC Connector. USB Based Program downloader 1 no. of USB based program downloader is provided for developed new program downloading to this controller. 3Ø SCR POWER MODULE-25A This power module is designed by using SCR & DIODE for 3 Phase AC-DC Controlled Converter applications This power module can be used for DC Motor open loop & closed loop speed control application by external PWM controller interfacing. It consists of SCR based 3 phase Half & Fully Controlled Converter, 6 nos. of SCR, Ratings @ 1200V |

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| | | @ 50A, fixed With proper heat sink for cooling and Snubber circuit, 2 nos. of Diode ( 50A , 1200V) with With proper heat sink for cooling and Snubber circuit, 6 nos. of Pulse amplifier & 1:1 Pulse transformer for all pulse isolation, 1 no. of 3 Phase 230/9V Supply synchronizing transformer & ZCD Circuit is provided for SCR Pulse generation, MCB provided for input power ON/OFF, SCR &Diode outputs and AC inputs are terminated in banana connector. Specifications Input- 3 phase 440VAC, Output – 0-600V AC/DC @ 25A DC Shunt Motor with load set up Type : DC Shunt Motor, Power : 1 HP, Voltage : 200Vdc for Armature & Field, Speed : 1500 RPM, Feedback sensor : Proximity sensor, Loading : spring balance loading. Spring balance Loading 1 no. Brake DRUM with spring balance set up is coupled with the above motor, 2 nos. of dial indication for load in Kg measurement. All are mounted on a powder coated mechanical set up. |
| 9 | Set up for SRM Drive | **Set up for SRM Drive**<br>This set up consists of FPGA based PWM Controller, SR - IGBT Power Module, 1HP Switched Reluctance Motor set up. FPGA based PWM Controller This PWM controller is designed based on SPARTAN-6 FPGA controller chip and this controller can be used to generate PWM Signals for SCR, IGBT based power electronics application like DC-AC Inverter ,DC-DC Chopper & SCR converter based AC/DC/BLDC Switched Reluctance Motor (SRM) control application. PWM output of this controller can be interfaced with Power Module through External cable connection. FPGA Features FPGA Device : XC6SLX9 (Spartan-6 XC6SLX9 in TQG144 package), Number Of Clock Sources : 1, Primary Clock Frequency : 100MHz (100MHz CMOS oscillator), Number Of GPIOs (Max) : 70, Configuration Options : USB 2.0 interface for On-board flash programming, JTAG Configuration Memory : Flash memory-16 Mb SPI flash memory (M25P16), Power supply : On-board voltage regulators for single power rail operation Keys & Displays 20 X4 LCD Display is provided to indicate control parameters, 2 nos. of PWM/Pulse INC-DEC Keys are provided, 4 nos. of Toggle switches is provided. PWM Outputs & Digital I/O'S 6 nos. of PWM output @ 5V logic level (3.3v to 5V level converter is provided), 21 nos. of digital I/O's @ 3.3V logic level is terminated at separate connector, 18 nos. of digital I/O's @ 3.3V logic level is terminated at separate connector, 3 nos. of Digital input @ 5V logic level is provided for speed sensor interface / Motor feedback (hall sensor) interface ADC/DAC 4 Channel I2C based ADC ( 8 BIT), 1 Channel DAC ( 8 BIT) LEDS 4 nos. of LED is provided for toggle switch status indication, 3 nos. of LED is provided for feedback input- status indication, 3 nos. of LED is provided power supply status indication. Power supply 5VDC@1A dc regulated power supply is provided for controller input, 5V to 3.3V converter is provided for FPGA Controller, FPGA board is mounted on nice powder coated cabinet, 230VAC Input with power ON/OFF Switch. SR IGBT power module (SPLIT DC POWER CIRCUIT) This power module is designed by using IGBT based Smart Power Module (SPM) for SR Motor control application. This power module can be used by proper PWM external controller interfacing. It consists of IGBT based Smart Power Module (SPM) based Voltage source inverter, 6 nos. of IGBT in a single chip, Ratings @ 600V @ 20A, Device is fixed With proper heat sink for cooling, Single phase Diode rectifier ( 35A , 600V) with filter capacitor is provided for AC-DC Conversion, Built In IGBT driver circuit & 4 Numbers of OPTO-IC is provided for all PWM isolation, 4 nos. of Hall effect current sensor is provided for output motor current measurement, 1 no. of Hall effect current sensor is provided for input DC current measurement, Over current trip circuit is provided with trip status indicator, External RESET switch is provided for Trip clear, MCB provided for input power ON/OFF, IGBT outputs and AC inputs are terminated in banana connector Specifications Input- 230VAC, Output – @ 6A suitable for 1 HP SR motor Switched reluctance Motor with spring balance load set up Type : SR Motor – 8/6 TYPE- 4 Phase, Power : 1 HP, Voltage : 150V, Speed : 2500 RPM & Double side shaft extension, Feedback sensor : 2 Number of Rotor position sensor, Loading : spring balance loading arrangement. Spring balance loading 1 no. Brake DRUM with spring balance set up is coupled with the above motor, 2 nos. of dial indication (0-10kg) for Load measurement in Kg. All are mounted on a powder coated mechanical set up. |

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| 10 | 3-phase Electrical Power Distribution Panel (415V, 100A, 50Hz) | 3-phase Electrical Power Distribution Panel (415V, 100A, 50Hz) |
| 11 | Itemwise Cabling of motors and panel, Cabling and earthing of panels and motors | **Cabling**<br>Itemwise Cabling of motors and panel, Cabling and earthing of panels and motors is required to be done by the supplier, Connections of motors to the panels, panels to the MCB boxes and cabling necessary for mains supply box of the lab, this must include supply of MCBs with proper ratings and box cabling using conduits and flexible pipes as and where necessary. Proper earthing of panels, motors, etc. using aluminium flat and GI wire of proper thickness and resistance.<br>**Installation & Commissioning of Machine Lab Equipments**<br>The Machines & panels should be interconnected from AC panel through UG Cable of size 20 / 4 sq mm for 32 Amps switches and 10 / 4 sq mm for 16 Amps switches (depending upon rating of the machine as indicated in the schedule). The make of the underground cable should be of well known standard quality.<br>**Grounding/Earthing**<br>At least two points of Rod and Plate type of grounding of proper rating as per National Electrical Code, to keep the earth resistance less than 5 ohms are to be provided. In case the earth resistance is more than 5 ohm, Bentonite should be added to each point to keep earth resistance with in 5 ohms. Funnel type of cups should be provided for water injection. All the Machines & Panels should be properly connected to these ground/earth points. Meters and Switch Gears All digital meters used should be of well-known standard quality. The Switch gears connected should be of well-known standard quality make. Where ever possible Multi Data Monitoring unit should be connected for Machines. |

**FORMAT FOR QUOTATION SUBMISSION**
(In letterhead of the supplier with seal)

Date: _____

To: _____
_____

| Sl. No. | Description of goods \ (with full Specifications) | Qty. | Unit | Quoted Unit rate in Rs. (Including Ex-Factory price, excise duty, packing and forwarding, transportation, insurance, other local costs incidental to delivery and warranty/ guaranty commitments) | Total Price (A) | Sales tax and other taxes payable | |
|---|---|---|---|---|---|---|---|
| | | | | | | In % | In figures (B) |
| | | | | | | | |
| **Total Cost** | | | | | | | |

Gross Total Cost (A+B): Rs. _____

We agree to supply the above goods in accordance with the technical specifications for a total contract price of Rs. _____ (Amount in figures) (Rupees _____ _____amount in words) within the period specified in the Invitation for Quotations.

We confirm that the normal commercial warranty/ guarantee of _____ months shall apply to the offered items and we also confirm to agree with terms and conditions as mentioned in the Invitation Letter.
We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery.

Signature of Supplier
Name: _____
Address: _____
Contact No. _____