

## INVITATION FOR TENDER FOR SUPPLY OF EQUIPMENT

Sealed tender offers are invited in two separate sealed covers (Technical and Commercial offers) from eligible manufacturers/suppliers or their direct Indian agents for the supply of the following equipment.

### **Supply, Erection, Testing & Commissioning Of Variable Frequency Drives (VFDs) and TWO 160 kW Motors in Motor-Generator Configuration**

Please send offers, ALONG WITH DESCRIPTIVE CATALOGUE/BROCHURES. Please mention if you can COMPLY or NOT to specifications mentioned in following pages. Validity of bid should be at least four months (120 days) or more from date of opening of tender. Please see that your quotation reaches not later than 20th Oct, 2017, 15:00 Hrs at the following address:

**Prof. Vikranth Racherla,**  
**Associate Professor, Mechanical Engineering Department,**  
**Indian Institute of Technology Kharagpur – 721 302, West Bengal, India**

Earnest money of Rs. 40,000/- is to be deposited in the form of Account payee Demand Draft in favour of IIT Kharagpur, payable at Kharagpur, India. Any bid which is not accompanied with an EMD shall be summarily rejected. Earnest money deposited will be forfeited if the tenderer withdraws or amends its tender or impairs or derogates from tender in any respect within period of validity of its tender. No interest will be paid on earnest money of the unsuccessful bidders.

<b>Tender Reference</b>	<b>IIT/SRIC/ CRR / BRE/ VR/2017-18/EQ-1, Dated: 19.09.2017</b>
<b>Price of Tender Document</b>	<b>NIL</b>
<b>Last Date and Time for submitting the tender document</b>	<b>20.10.2017 at 15:00 Hrs (Indian time)</b>
<b>Time and Date of Opening of Technical Bids</b>	<b>20.10.2017 at 16:00 Hrs (Indian time)</b>
<b>Place of Opening Tender</b>	<b>Center for Railway Research, Indian Institute of Technology Kharagpur – 721 302, West Bengal, India</b>
<b>Address of Communication</b>	<b>As stated above</b>
<b>Contact Telephone Numbers</b>	<b>+91- 3222 – 282900 (Prof Racherla) / 282400 (CRR)</b>
<b>E-mail</b>	<b>vikranth.racherla@mech.iitkgp.ernet.in</b>

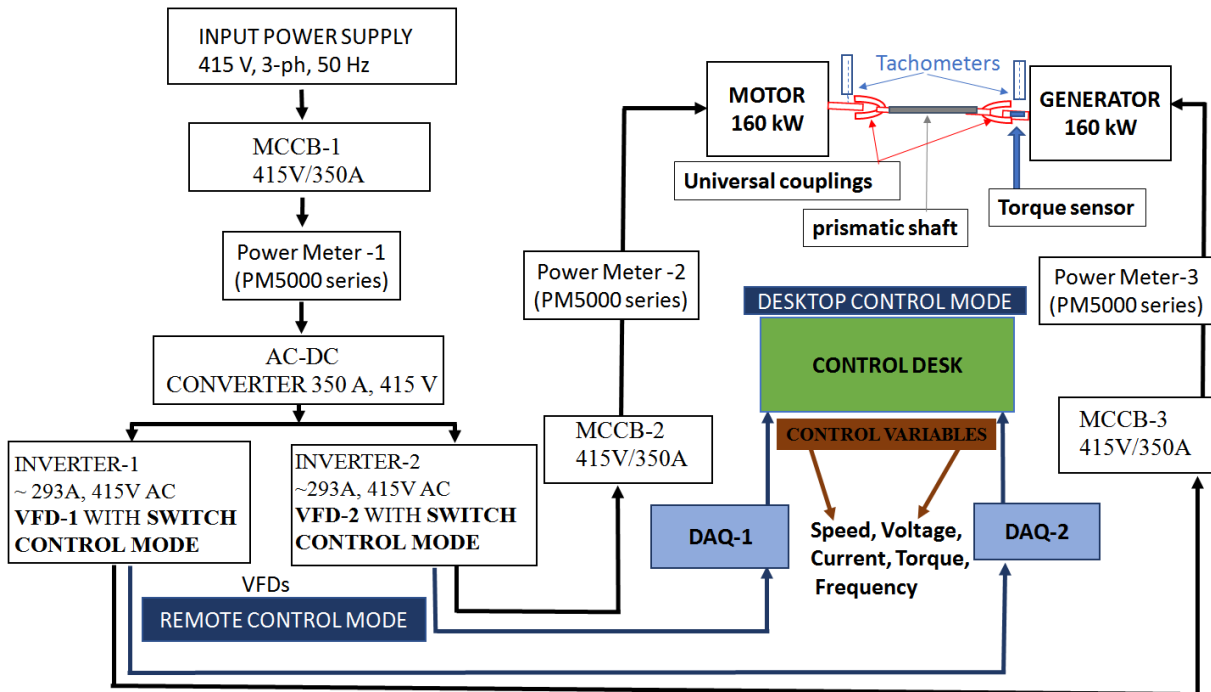
**DETAILED TECHNICAL SPECIFICATIONS FOR**

**Supply, Erection, Testing & Commissioning Of Variable Frequency Drive (VFD) of TWO  
160 kW Motors in Motor-Generator Configuration**

BRIEF TECHNICAL SPECIFICATIONSs (see following pages for detailed specifications)			Comply (Yes/No)	Remarks
S. No	Component	Material Description		
1	Electricals	Input Power Supply: 415 ± 41 V, 3Ph AC, 50 ± 2.5 Hz		
2	MCCB	(Molded case circuit breaker) as per requirement		
3	Power meter	03 NOS (Measurement: Energy, active and reactive power, current, voltage, frequency, power factor), accuracy class: 0.2S (IEC 62053-22)		
4	AC - DC converter	01 NOS		
5	Variable frequency drives (VFDs)	02 NOS		
6	Drive Motors	02 NOS, 160 kW, 415V 3Ph AC, 6 pole, IE3 grade, 50/75 Hz operation		
7	Tachometer	02 NOS, 0 to 2000 RPM		
8	Torque sensor	01 NOS, 0-2500 Nm, 0-2000 rpm		
9	Control (closed loop)	Speed control (to < 0.1% of set value for constant speed operation) for motor and torque control (to < 1% of set value for constant torque setting) for generator		
10	Location/Amb Temp	Indoor, Max. ambient temperature of 45° C		

11	Output variables to be provided	(1) Motor speed, generator speed, and generator torque, (2) Voltage, current, frequency, and power factor at (a) power inlet (i.e. power drawn from electrical line) and (b) at exit of the two inverters		
12	Output range (i.e. range corresponding to each of the output variables)	0-10 V		
13	Input variables	Time varying functions for motor speed and generator torque		
14	Input range	0-10 V		
15	Desired service life	Minimum 15 years with usage of about 25 hours per week		
16	Warranty	Minimum 3 years		
17	Supply, erection, testing, and commissioning			
18	User Manual	Complete detailed user manual of individual parts mentioned in the block diagram and other systems provided		
<p><b>NOTE:</b> THE FIRM SHALL VISIT OUR SITE AND ALL HAVE THEIR QUERIES ANSWERED BEFORE SUBMITTING THEIR DRAWINGS/TECHNICAL SPECS FOR FINAL APPROVAL BEFORE PROCUREMENT/FABRICATION OF SET UPS. SET UP MUST BE TESTED AT FACTORY BEFORE IT IS SENT TO IIT KHARAGPUR.</p>				

**BLOCK DIAGRAM OF DESIRED MOTOR-GENERATOR SET UP WITH COMMON DC BUS CONTROLLED BY VFDs :**



NOTE:

1. DAQs and control desk will be provided by IIT Kharagpur. They are not part of tender.
2. VFDs must also have remote control model in addition to switch control mode and desktop control mode.
3. Universal couplings and prismatic shaft are part of the tender and MUST be included in tender along with AC-DC converter (1 No), MCCBs (as required), VFDs (2 Nos), Motors (2 Nos), tachometers (2 Nos), torque sensor (1 No), and Power meter (03 Nos) .
4. State per unit cost of parts (Motors, VFDs, Torque sensor, etc.) along with shipping and commissioning costs separately in the quotation.
5. Provide data sheets and/or user manuals/catalogues for each of the parts quoted. Specifications in data sheets must match requirements specified.

DETAILED TECHNICAL SPECIFICATIONS

**Variable Frequency Drives (VFD):**

VFDs will be used for operating 160 kW, 415V, 3Ph AC, 6 pole, IE3 grade electric motor and generator at 50/75 Hz.

	Description	Comply (Yes/No)
<b>Control methodology</b>	<ul style="list-style-type: none"> <li>● VFDs must operate 160 kW, 415V 3Ph AC, 6 pole, IE3 grade electric motor and generator at <u>50/75 Hz</u></li> <li>● VFDs must run in three modes                             <ul style="list-style-type: none"> <li>■ <b>Remote mode</b> : Inputs to VFDs (e.g. speed or torque settings) are given through a remote</li> <li>■ <b>Switch control mode</b> : VFD is operated manually through buttons/dials</li> <li>■ <b>Desktop control mode</b>: Inputs to VFDs (e.g. speed or torque settings) are given through a desktop computer</li> </ul> </li> </ul>	

**General requirements:**

	Description	QTY	Comply (Yes/No)
<b>VFD</b>	<ul style="list-style-type: none"> <li>● VFD must be of heavy duty type and operate without any problem even at an ambient temperature of 45 degree Celsius.</li> <li>● Must allow to set motor rpm to any integer value from 0 to Max (e.g. up to around 990 rpm for 50 Hz operation or 1445 rpm for 75 Hz operation) and must allow torque to be set</li> </ul>		

	<p>from 0 to maximum value (e.g. around 1500 Nm for 50 Hz operation or 1000 Nm for 75 Hz operation).</p> <ul style="list-style-type: none"> <li>● Must demonstrate operation of motor at linearly varying speed from zero to maximum rpm (e.g. 990 rpm) and maximum to zero rpm at constant torque</li> <li>● Must demonstrate operation of generator at linearly varying torque from maximum to zero torque and zero to maximum torque (e.g. ~ 1500 Nm) at constant speed (~ 990 rpm)</li> <li>● Overloading: 150% of VFD rated current for 30s or more</li> <li>● Software must be provided to interface with VFDs from a desktop computer</li> <li>● Must have following built-in protections <ul style="list-style-type: none"> <li>● Built-in electronic thermal overload relay</li> <li>● Overcurrent and overvoltage protection</li> <li>● Stall prevention</li> <li>● Earth leakage protection</li> </ul> </li> <li>● PCB coatings should conform to class 3C2 of IEC60721-3-3 class or better</li> <li>● Modules must have CE, UL, C- Tick, RoHS certification or better</li> <li>● VFD body panels must be designed as per minimum of IP42 protection with door sheet thickness of minimum 2 mm and load bearing member sheet thickness of minimum 3 mm</li> </ul> <p><b>Make:</b> Crompton greaves/ABB/Equivalent</p>		
<p><b>LAMPS</b></p>	<ul style="list-style-type: none"> <li>● Incoming supply R phase indication lamp 415 V AC, color : Red</li> <li>● Incoming supply Y phase lamp 415 V AC, color: Yellow</li> <li>● Incoming supply B phase lamp 415 V AC; color : Blue</li> <li>● “ON” Indication light 415 V AC, color: Red</li> </ul>		

	<ul style="list-style-type: none"> <li>● “OFF” Indication light 415 V AC, color: Green</li> <li>● “TRIP” Indication light</li> <li>● “REMOTE” Indication light</li> <li>● “LOCAL” Indication light</li> </ul>		
Push buttons/Switches	<ul style="list-style-type: none"> <li>● Start push button, type: Spring return, color: Green</li> <li>● Stop push button, type: Spring return, color: Red</li> <li>● Emergency stop push button, type: Latch type</li> <li>● VFD DOL bypass switch</li> <li>● VFD operation mode selections switch for local/remote selection</li> </ul>		
Motors	<p>160 kW (mechanical power output for motor), 6-pole, 415 V, 3 ph, 50/75 Hz, IE3 grade. Full load torque of around 1500 Nm at 50 Hz and 1000 Nm at 75 Hz, rotational speed of around 990 rpm at 50 Hz and 1450 rpm at 75 Hz</p> <p><b>Make:</b> Crompton greaves/ABB/Kirloskar/Equivalent.</p>	02 NOS	
AC-DC Converter	<p>Input power supply 415V, 50 Hz, 250 A, with active front end,</p> <p><b>Make:</b>HBM/HONEYWELL/Cromptongreaves/EQUIVALENT</p>	01 NOS	
Tachometers	<p>0-2000 rpm, non-contact type/contact type, Accuracy: 0.01% or better, Resolution: 0.1 RPM under 1000 RPM or better</p>	02 NOS	
Torque sensor	<p>0-2500 Nm or better, 0.1% accuracy or better, 0-2000 rpm or better, environmental protection of IP65 or better, static safe overload - 150 % of FS or better, double coupling</p> <p><b>Make :</b> HBM / HONEYWELL / EQUIVALENT</p>	01 NOS	
Molded case circuit breaker	<p>415V, 350A</p> <p><b>Make :</b> HONEYWELL/ABB/EQUIVALENT</p>	03 NOS	

Power meter	Supply voltage: 100 - 480V , 50±5/75±5 Hz, Accuracy class: 0.2S, IP52 protection <b>Measurement accuracy:</b> ±0.5% apparent power ±0.05% frequency, ±0.2% active energy, ±1% reactive energy, ±0.2% active power, ±0.1% voltage, ±0.05% power factor , ±0.15% current	03 NOS	
Warranty	3 years	----	
Supply, erection, testing, and commissioning	Company supplying the items will also have to commission the set up. Company must show that requirements listed in the “Detailed technical specifications” section of this tender are met during commissioning.	----	

**Basic Input Output Data for VFD:**

<b>Control signal input</b>	
<b>Digital (8 channels/as needed)</b>	
Resolution	Minimum 10 bit
<b>Analogue ( 8 channel/as needed)</b>	
Analogue voltage/current	0-10V (preferred) / 0-20 mA
Maximum input voltage	+30 V

<b>Control signal Output</b>	
<b>Digital (8 channels/as needed)</b>	
Resolution	Min 10 bit
<b>Analogue ( 8 channel/as needed)</b>	
Output voltage/current	0-10 V (preferred) / 0-20 mA



## **GENERAL TERMS & CONDITIONS**

PLEASE SPECIFICALLY INDICATE THE FOLLOWING POINTS IN YOUR QUOTATIONS AND COMPLY THE TERMS AS MENTIONED HEREUNDER:-

1. TENDER ARE INVITED COMPLYING THE REQUIREMENT FOR TENDER AS DETAILED IN THE TENDER SPECIFICATION TO BE SUBMITTED IN THE COMPANY'S / FIRM'S LETTERHEAD NEATLY PRINTED / TYPED DULY SIGNED BY AUTHORIZED PERSON WITH THE SEAL OF THE BIDDERS. ALL ENVELOPS CONTAINING THE TENDER SHOULD BE PROPERLY SEALED. SEPARATE ENVELOPS SHOULD BE USED FOR TECHNICAL AND PRICE BID AND INDICATION TO THEIR EFFECT MAY PLEASE BE SUPERSCRIBED ON THE ENVELOP.

### **THE FOLLOWING DOCUMENTS ARE REQUIRED FROM THE INDIAN AGENTS OF FOREIGN FIRMS:**

1.1 FOREIGN PRINCIPAL'S PROFORMA INVOICE INDICATING THE COMMISSION PAYABLE TO THE INDIAN AGENT AND NATURE OF AFTER SALES SERVICE TO BE RENDERED BY THE INDIAN AGENT.

1.2 COPY OF THE AGENCY AGREEMENT WITH THE FOREIGN PRINCIPAL INDICATING THE NATURE OF AFTER SALES SERVICES, PRECISE RELATIONSHIP BETWEEN THEM AND THEIR MUTUAL INTEREST IN THE BUSINESS.

1.3 PLEASE ENCLOSE THE DOCUMENT(S) RELATED TO THE ENLISTMENT OF THE INDIAN AGENT WITH DIRECTOR GENERAL OF SUPPLIES & DISPOSALS (DGS & R) UNDER THE COMPULSORY REGISTRATION SCHEME OF MINISTRY OF FINANCE.

2. TECHNICAL CATALOGUE/LEAFLET SHOULD BE ENCLOSED WITHOUT FAIL. PROVIDE COMPLIANCE STATEMENT WITH RESPECT TO THE TECHNICAL SPECIFICATIONS MENTIONED ABOVE.

3. PLEASE CONFIRM WHETHER YOU ARE AUTHORISED TO QUOTE ON BEHALF OF YOUR PRINCIPALS AND IF SO, PLEASE ENCLOSE A COPY OF SUCH AUTHORISATION WITH YOUR QUOTATION.

4. **PRICE BIDS FOR FOREIGN FIRMS:** PRICES ARE TO BE QUOTED ON 'EX-WORKS' DULY PACKED OR ON "FCA/FOB" INTERNATIONAL PORT" BASIS AND ALSO INCLUDING AGENCY COMMISSION PAYABLE TO YOUR INDIAN AGENTS, IF ANY SHOWING CLEARLY THE FOLLOWING BREAK UP:-

- I) EX-WORKS PRICE
- II) PACKING & FORWARDING
- III) FREIGHT
- IV) ANY OTHER RELEVANT EXPENSES.
- V) TAXES PAYABLE BY THE INSTITUTE

INSURANCE WILL BE PAID BY OUR INSTITUTE SEPARATELY AND SHOULD NOT FORM PART OF THE QUOTED PRICE.

**PRICE BIDS FOR INDIAN FIRMS:** PRICES ARE TO BE QUOTED ON F.O.R., IIT KHARAGPUR, ON DOOR DELIVERY BASIS CLEARLY SHOWING THE BREAK UP.

5. **PERIOD OF VALIDITY:** BIDS SHALL REMAIN VALID FOR ACCEPTANCE FOR A PERIOD OF 120 DAYS FROM THE DATE OF OPENING.

6. INDIAN AGENTS ADDRESS AND PERCENTAGE OF AGENCY COMMISSION INCLUDED IN ABOVE F.O.B./EX-WORKS PRICE. (THIS WILL BE PAID TO THE INDIAN AGENTS IN INDIAN RUPEES ONLY AND NOT IN **FE**). PLEASE ENCLOSE COPY OF AGENCY AGREEMENT ENTERED INTO WITH YOUR PRINCIPALS INDICATING THE NATURE OF AFTER SALES SERVICES OF INDIAN AGENTS, PRECISE RELATIONSHIP & MUTUAL INTEREST IN THE BUSINESS.

7. **MEASUREMENTS/WEIGHT:** NETT/GROSS OF THE CONSIGNMENT. IN CASE OF AN ORDER, YOU SHALL USE AIR WORTHY PACKAGE (AS APPLICABLE) DULY CERTIFIED

WITH DOCUMENTS – PLYTO – SANITARY CERTIFICATE (AS PER QUARANTINE ORDER 2003).

8. **SCOPE OF SUPPLY:** SHOULD INCLUDE FREE INSTALLATION AND COMMISSIONING

9. **PAYMENT TERMS FOR FOREIGN FIRMS**

**The offer will be made on a single currency and only one PO will be issued for the entire scope of the supply.**

A) 90% PAYMENT THROUGH SIGHT DRAFT/FORIGN DEMAND DRAFT/LC (EXCEPTIONAL CASES)/SWIFT TELE TRANSFER AFTER RECEIPT OF STORE IN GOOD ORDER AND CONDITION AND 10% AFTER SUCCESSFUL INSTALLATION & COMMISSIONING.

B) BANK CHARGES ON LC/SD (WITHIN INDIA APPLICANT ACCOUNT AND OUTSIDE INDIA TO BENEFICIARY ACCOUNT).

**PAYMENT TERMS FOR INDIAN FIRMS**

A) 100% PAYMENT THROUGH CROSSED ACCOUNT PAYEE CHEQUE / ELECTRONIC TRANSFER AFTER RECEIPT OF STORE IN GOOD ORDER & CONDITION AND SUCCESSFUL INSTALLATION & COMMISSIONING.

B) ENSURE MENTIONING

i) BANK DETAILS OF THE BENEFICIARY, GST NO. AND PAN NUMBER

ii) FULL NAME AND ADDRESS OF THE BENEFICIARY ON WHOM ORDER HAS TO BE PLACED

10. WHETHER ANY EXPORT LICENCE IS REQUIRED FROM YOUR GOVERNMENT, IF SO, PLEASE CONFIRM WITH DETAILS.

11. COUNTRY OF ORIGIN OF THE GOODS IS TO BE MENTIONED.

12. THE INSTITUTE SHALL PROVIDE THE CONCESSIONAL CUSTOMS DUTY AND EXCISE DUTY EXEMPTION CERTIFICATE AS PER GOVT. NOTIFICATION NO. 51/96 CUSTOMS DATED: 23.07.1996 AND CENTRAL EXCISE DUTY EXEMPTION IN TERMS OF GOVT. NOTIFICATION NO. 10/97 – CENTRAL EXCISE DATED: 01.03.1997 AS AMENDED FROM TIME TO TIME.

13. **LIQUIDATED DAMAGES:** THE STORES SHOULD BE DELIVERED / DISPATCHED TO DESTINATION AND READY FOR OPERATION NOT LATER THAN THE DELIVERY DATE SPECIFIED. IF THE SUPPLIER FAILS TO DELIVER ANY OR ALL THE STORES OR PERFORM THE SERVICE BY THE SPECIFIED DATE, LIQUIDATED DAMAGES AT 1% PER MONTH OR PART THEREOF IN RESPECT OF THE VALUE OF STORES WILL BE DEDUCTED FROM THE CONTRACT PRICE SUBJECT TO A MAXIMUM OF 5%. ALTERNATIVELY, THE ORDER WILL BE CANCELLED AND THE UNDELIVERED STORES PURCHASED FROM ELSEWHERE AT THE RISK AND EXPENSE OF SUPPLIER.

14. **PATENT RIGHTS:** THE SUPPLIER SHALL INDEMNIFY THE PURCHASE AGAINST ALL THIRD PARTY CLAIMS OF INFRINGEMENT OF PATENT, TRADEMARK OR INDUSTRIAL DESIGN RIGHTS ARISING FROM USE OF THE GOODS OR ANY PART THEREOF IN INDIA.

15. ONLY THOSE BIDDERS WHO'S BIDS HAVE BEEN TECHNICALLY FOUND ACCEPTABLE WILL ONLY BE INVITED FOR PARTICIPATION IN THE PRICE BID.

16. THOSE BIDDERS WHO DO NOT RECEIVE ANY COMMUNICATION FOR PARTICIPATION IN PRICE BID OPENING MEETING MAY PRESUME THAT THEIR BID HAS NOT BEEN ACCEPTED BY THE INSTITUTE.

17. CONDITIONAL OFFER WILL NOT BE ACCEPTED.

18. LATE TENDERS I.E. TENDER RECEIVED AFTER THE DUE DATE AND TIME OF SUBMISSION AS MENTIONED ABOVE SHALL NOT BE ACCEPTED.

19. BIDDERS TO ENCLOSE THE FOLLOWING DOCUMENTS:-

A) CURRENT INCOME TAX AND SALES TAX CLEARANCE CERTIFICATES (GST No.), AND PAN NO.

B) BANKER'S SOLVENCY CERTIFICATE

C) SUMMARY OF AUDITED STATEMENT OF ACCOUNTS FOR THE LAST THREE YEARS TO BE ENCLOSED AND FINANCIAL HIGHLIGHTS AND THE KEY PERFORMANCE DURING THE LAST THREE QUARTERS TO BE ENCLOSED AS PER FORMAT:-

COMPANY'S KEY PERFORMANCE

DESCRIPTION	JAN. TO MARCH	APRIL TO JUNE	JULY TO SEPT.
GROSS REVENUE			
PROFIT BEFORE TAX			
PROFIT AFTER TAX			
RETURN ON INVESTED			
CAPITAL (ROIC)			

D) CUSTOMER SATISFACTION CERTIFICATE FROM ONE SUCH ORGANIZATION IS TO BE ATTACHED WITH THE TECHNICAL BID AND PRICE BID.

E) NAME AND ADDRESS OF MINIMUM THREE CLIENTS TO WHOM SUCH EQUIPMENT HAVE BEEN SUPPLIED SHOULD BE MENTIONED.

20. **WARRANTY / GUARANTEE:** THIS COMPREHENSIVE WARRANTY / GUARANTEE SHALL REMAIN VALID FOR 36 MONTHS AFTER THE GOODS (OR ANY PORTION THEREOF AS THE CASE MAY BE) HAVE BEEN DELIVERED AND COMMISSIONED TO THE FINAL DESTINATION.

21. THE INSTITUTE DOES NOT BIND ITSELF TO OFFER ANY EXPLANATION TO THOSE BIDDERS WHO'S TECHNICAL BID HAS NOT BEEN FOUND ACCEPTABLE BY THE EVALUATION COMMITTEE OF THE INSTITUTE.

22. ALL TENDERS (UNLESS OTHERWISE SPECIFIED) ARE TO BE SUBMITTED / HANDED OVER TO **DR. VIKRANTH RACHERLA, ASSOCIATE PROFESSOR, MECHANICAL ENGINEERING, INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR - 721 302** AND ACKNOWLEDGEMENT TO BE OBTAINED.

## IMPORTANT

1. IIT Kharagpur authority may accept or reject any or all the bids in part or in full without assigning any reason and does not bind itself to accept the lowest bid. The Institute at its discretion may change the quantity / upgrade the criteria / drop any item or part thereof at any time before placing the Purchase Order.
2. Promptly make arrangements for repair and / or replacement of any damaged item (s) irrespective of settlement of claim.
3. In case of any dispute, the decision of the Institute authority shall be final and binding on the bidders.
4. For any query pertaining to this bid document correspondence may be addressed to **Dr. Vikranth Racherla, Associate Professor** at the address mentioned above.

### LAST DATE FOR SUBMISSION OF SEALED BIDS: 20.10.2017

- 1) Please Note that the Institute remains closed during Saturdays & Sundays and all specified government holidays.
  - 2) Fax, e-mail Tender will not be accepted.
  - 3) The General Terms and Conditions as stated above relate to supply of stores / equipment /assets etc. and for specific service other terms and conditions of the Institute will apply.
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