

## 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 & Commissioning Of 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 22st Dec, 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/EQUIP-1, Dated: 1.12.2017</b>
<b>Price of Tender Document</b>	<b>NIL</b>
<b>Last Date and Time for submitting the tender document</b>	<b>22.12.2017 at 15:00 Hrs (Indian time)</b>
<b>Time and Date of Opening of Technical Bids</b>	<b>22.12.2017 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>

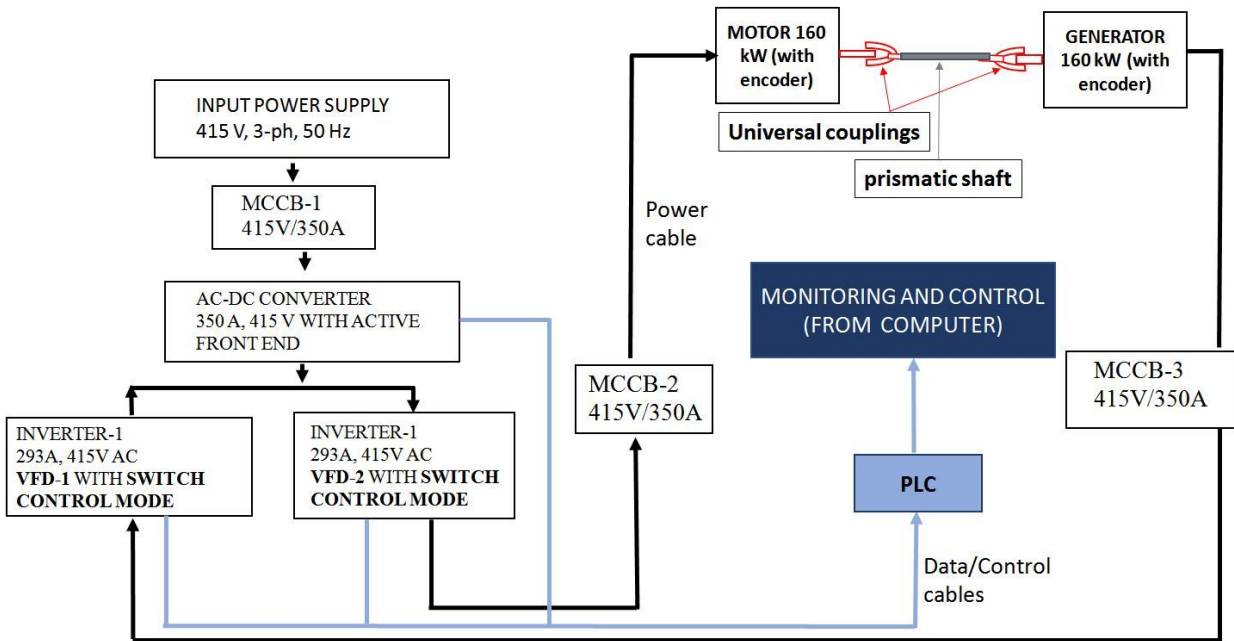
**DETAILED TECHNICAL SPECIFICATIONS FOR**

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

BRIEF TECHNICAL SPECIFICATIONS (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	415 V, 350 A, 3 NOS		
3	AC - DC converter with Active front end	01 NOS		
4	Variable frequency drives (VFDs)	02 NOS		
5	Drive Motors	02 NOS, 160 kW, 415V 3Ph AC, 6 pole, IE3 grade, 50/75 Hz operation		
6	Encoders	0 to 3000 RPM, Resolution > 1000 steps per turn, 02 NOS		
7	Control (closed loop)	Speed control to < 0.05% of set value for constant speed operation for motor at full speed and torque control to < 3% at set value at full speed		
8	Location/Amb Temp	Indoor, Max. ambient temperature of 45° C		
9	PLC with HMI	PLC with HMI hardware and software to control		

		motor speed and generator torque and to monitor motor, generator speeds, and voltage, current, frequency, power factor in Active Front end and VFDs		
10	<b>Schematic and Bill of Materials</b>	Schematic of the set up showing all major components (MCCBs, Active Front End, VFDs, PLC with HMI, motors, encoders, and prismatic shaft with universal couplings) with make and model numbers of ALL components and Bill of Materials of all major components.		
11	Desired service life	Minimum 15 years with usage of about 25 hours per week		
12	Comprehensive warranty for all items	Minimum 3 years. Parts to be replaced free of cost in warranty period if they get damaged while operating within specified operating conditions.		
13	Supply and commissioning	All data/control cables are to be provided by bidding company. However, power cables to active front end, VFDs, and motors shall be provided by IIT.		
14	User Manual	Complete detailed user manual of individual parts mentioned in the block diagram and other systems provided		
	<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.			

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



**NOTE:**

1. Desktop computer with necessary operating system will be provided by IIT Kharagpur. However, necessary PLC with HMI hardware and associated software must be part of the tender and provided by bidding company.
2. VFDs must have 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 with Active front end (1 No), MCCBs (3 NOS), VFDs (2 Nos), Motors (2 Nos), encoders (2 Nos), and PLC with HMI.
4. **State per unit cost of items (MCCBs, Active Front end, VFDs, Motors, Encoders, Cardan Shaft, 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. Label the data sheets as per S.No. in bill of materials. Specifications in data sheets must match requirements specified. Highlight the part in data sheets that show that compliance with tender specifications is being ensured.
6. Power cables shall be provided by IIT Kharagpur, however, data and control cables, must be provided by the bidding company.
7. **Company representative(s) must visit IIT Kharagpur with (a) Schematic of the setup and (b) Bill of materials, to understand the requirement before submitting the bids**

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>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 operate without any problem even at an ambient temperature of 45 degree Celsius.</li> <li>● Must allow to set motor rpm 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 from 0 to maximum</li> </ul>		

	<p>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 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: 120% of VFD rated current for 10s or more</li> <li>● Software must be provided to interface with VFDs via PLC and HMI from 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>		
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	<b>Make:</b> Crompton greaves/ABB/Equivalent		
<b>LAMPS</b>	<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> <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	160 kW (mechanical power output for motor), 6-pole, 415 V, 3 ph, <b>75 Hz</b> , 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	02 NOS	

	<b>Make:</b> Crompton greaves/ABB/Kirloskar/Siemens/Equivalent.		
AC-DC Converter Active Front End	Input power supply 415V, 50 Hz, 350 A, with active front end <b>Make:</b> HBM/HONEYWELL/Cromptongreaves/EQUIVALENT	01 NOS	
Encoders	0-3000 rpm, Resolution of more than 1000 steps per revolution	02 NOS	
PLC with HMI	PLC with HMI hardware and software to control motor speed and generator torque and to monitor motor, generator speeds, and voltage, current, frequency, power factor in VFDs and Active Front End <b>Make :</b> Siemens/ Honeywell/ABB/ EQUIVALENT	AS REQUIRED	
Molded case circuit breaker	415V, 350A <b>Make :</b> HONEYWELL/ABB/EQUIVALENT	03 NOS	
Comprehensive warranty	3 years or more. Minimum 3 years. Parts to be replaced free of cost in warranty period if they get damaged while operating within specified operating conditions.	-----	
Supply and commissioning	Company supplying the items will also have to commission the set up. Loading and unloading of items will also be in the scope of bidding company. Company must show that requirements listed in the “Detailed technical specifications” section of this tender are met during commissioning.	-----	



## **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 ENVELOPES 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/FOREIGN 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'S 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 WHOSE 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 WHOSE 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: 22.12.2017

- 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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