Reference No.: CC/500377/16-17 Date: 18.04.2017

Expression of Interest

For

Appointment of an Agency for Design, Site preparation, Supply, Installation, Testing, Commissioning, Operations and Maintenance of Basic Infrastructure for 5 years for the establishment of a Computer Centre with HPC facility at IIT(ISM) Dhanbad on turnkey basis

IIT(ISM) Dhanbad

Dhanbad-826004, JHARKHAND

18/4/17

Deputy Registrar

Invitation for EXPRESSION OF INTEREST

Introduction

The IIT (ISM) Dhanbad is a premiere institute of higher education under Ministry of Human Resource Development (MHRD). It is located in the mineral-rich region of India, in the city of Dhanbad.

IIT (ISM) Dhanbad is planning to setup a Computer Centre cum Data Centre (Tier III standards) with 20 TF (Theoretical Peak with minimum 85% efficiency) High Performance Computing (HPC) cluster in its Old Lecture Hall Complex (OLHC) building to meet its upcoming IT, ITES and Computing Infrastructure as per the evolving standards of IITs.

The present Computer Centre is operating from its own building situated near New Academic Complex of ISM Campus and is solely responsible for creating and up keeping the Information and Communication Technology & Computation related facilities available at IIT (ISM) Dhanbad since its inception in 1987.

IIT (ISM) Dhanbad invites Expression of Interest (EOI) from reputed firm (OEMs/System Integrators, hereafter called the firm) of India to provide state-of-art solution for design, site preparation, supply, installation, testing, commissioning, operations and maintenance of basic infrastructure for the establishment of a proposed computer centre with HPC facility at IIT (ISM) Dhanbad.

Brief Requirements

In order to meet its upcoming Computing and IT services requirements, IIT (ISM) Dhanbad is planning to enhance Central Computing and Data Centre infrastructure at OLHC. The approximate built up area of the ground floor of OLHC is about 1304.71 sq. m. The proposed Computer Centre will comprise of 20 TF HPC cluster solution, Network Operation Centre (NOC) with video wall or similar using two large display units, 150 seater auditorium with smart class and video conferencing facility, One high throughput access lab, 2 class rooms having 50 seating capacity, staging and testing room, TELCO room, store room, fire suppressing cylinder room, adequate sitting chambers for Engineers/Technicians and staff members etc. Necessary Civil works, Electric works (including distribution of mains, lighting LT panels, UPS power and generators), Closed loop cooling, Air conditioning, Data Centre Infrastructure Management System (DCIM), Integrated Building Management System (IBMS) with physical security (access control) with fire fighting facility are required for the whole centre. The present structure of the building is about 8 years old. The bidder needs to be plan UPS room, battery room, panel room etc. within the closed areas of the building. The Chiller, DG sets and HT equipment to be planned in the external areas available just adjacent to the OLHC. Auditorium should have Display, Video, Audio and Unified Control System for setting up video conferencing facility. The servers, workstations and any active components, which are integral part of the infrastructure within the scope of this document, have to be provided for, supplied, installed and commissioned by the bidder.

EOI Submission Date and Time:

1.	Issue of EOI document	**18.04.2017**
2.	Last date and time of submitting EOI	**09.05.2017 till 1:00 P.M.**
3.	Last date of submission of any kind of clarification	**25.04.2017 till 4:00 P.M.**
4.	Opening of the EOI bid	**09.05.2017 till 3:30 P.M.**
5.	Tentative Cost of the project	**14 Crore**
4.	Date and time of presentation by shortlisted bidders	Will be communicated later via Email only.

Those who have already applied in earlier EOI with the same subject line, need not apply again. Detailed terms and conditions including prescribed format is available on the Institute website: www.iitism.ac.in/computer-centre/ccdc.html.

The date of presentation will be informed through email only. It will be the responsibility of the interested firms submitting the EOI to provide their communication details properly.

Interested parties are required to submit the hard copy of same to:

Deputy Registrar, Purchase and Stores,
IIT (ISM) Dhanbad-826004, JHARKHAND
drps@ismdhanbad.ac.in
Phone 0326 2235612

on or before the due date. Please send the document in a sealed envelope super-scribing on the top of the envelope **"Appointment of an Agency for Design, Site preparation, Supply, Installation, Testing, Commissioning, Operations and Maintenance of Basic Infrastructure for the establishment of a Computer Centre with HPC facility at IIT(ISM) Dhanbad for 5 years on turnkey basis".**

General Terms and Conditions

1. The Expression of Interest must be accompanied with duly filled Information sheets and sufficient documentary evidence. Expression of Interest within complete Information or insufficient documentary evidence shall be rejected.
2. IIT (ISM) Dhanbad reserves the right to modify, expand, restrict, scrap, and refloat the Expression of Interest.
3. **Formal Tender/Bid (Technical and Financial bids) will be invited later from the eligible/qualifying firms base done the EOI submitted and presentation. Physical presence of the firm shall be mandatory at the time of presentation of solution in response of EOI submitted before to the committee. No EOI shall be**

considered in absence of detailed technical presentation and complete solution in front of the committee on the dates decided by the Institute.

4. EOI document cost: Cost of the EOI document is to be paid by way of an a/c payee demand draft for an amount of Rs.500/- drawn in favor of Registrar, IIT (ISM) Dhanbad and payable at SBI, ISM Campus Branch or any other Bank/Branch located in Dhanbad. EOI cost is non-refundable and non-transferable. Alternatively, intending bidders may download the complete set of EOI document from IIT (ISM) Dhanbad website (www.iitism.ac.in/computer-centre/ccdc.html) and submit the same duly signed on all pages by the bidders along with demand draft for EOI document cost. Necessary Tender Fee as well as EMD will be required when the NIT will be issued to the shortlisted vendors and the amount will be announced/informed later.
5. Clarification: Clarification, if any, about the requirement can be obtained by visiting Purchase Section/Computer Centre with prior information within the due date mentioned above. Queries received after the due date will not be entertained.
6. It will be the sole discretion of IIT (ISM) Dhanbad to or not to incorporate any changes in the requirement based on feedbacks/inputs/suggestions received during the presentation/discussion. The decision of the ISM regarding acceptability of any suggestion shall be final in this regard.
7. Disputes, if any, shall be resolved mutually or shall be referred for arbitration to the Head of the Institution and his decision shall be final and binding on the firms. If arbitration fails, the dispute arising out of this shall be subjected to Jurisdiction - courts of Dhanbad only.
8. Only shortlisted vendor who has participated in the EOI will be allowed to finally submit their quotation (technical and financial). Those who have not been shortlisted in EOI will not be allowed to submit their quotation and the quotation received from any such vendor will be rejected. **Hence all the prospective bidders are requested to participate in EOI.**
9. The firm (OEM/ System Integrator) is required to do the site survey and submit the complete solution with EOI including detailed design and drawings. The survey shall be carried out with prior permission of the institute authorities.
10. Bidder should be either an Original Equipment Manufacturer (OEM) or should be single Authorized System Integrator Partner having Direct Purchase and Support Agreement with the OEM. Relevant documents need to be enclosed.
11. IIT (ISM) Dhanbad requires that there be a Single Point of Contact (SPOC) from OEM who is responsible for all issues between IIT(ISM) Dhanbad and the OEM.
12. All necessary catalogue/drawing literature/data and details of item(s) shall accompany the bid as these are considered to be essential for full and correct evaluation of the bid.
13. The bidder is to submit a CD/DVD containing all the detailed design with technical specifications of the equipment.
14. **3 years warranty is required for all equipment proposed in the total solution. Mention warranty for 4th and 5th years separately.**

15. This EoI is not an offer and is issued with no commitment. IIT (ISM) reserves the right to withdraw the EoI and change or vary any part thereof at any stage. IIT (ISM) also reserves the right to disqualify any bidder, should it be so necessary at any stage.

16. IIT (ISM) reserves the right to withdraw this EoI if IIT (ISM) determines that such action is in the best interest of the Government of India.

17. Short-listed bidders would be issued formal tender enquiry/Request for Proposal inviting their technical and commercial bids at a later date.

18. Timing and sequence of events resulting from this EoI shall ultimately be determined by IIT (ISM).

Pre-qualification Criteria

All bids will primarily be evaluated on the basis of Prequalification Criteria. The Evaluation Committee will carry out a detailed evaluation of the proposals, only those who qualifies all prequalification criteria, are eligible for evaluation of technical bids.The bidder must possess the requisite experience, strength and capabilities in providing the services necessary to meet the requirements, as described in the document. The bidder must also possess the technical knowhow and the financial wherewithal that would be required to successfully provide the data centre and support services sought for the entire period of the contract. The invitation to the bids is open to all bidders who qualify the eligibility criteria as follows:

Sl. No.	Basic Requirement	Criteria	Documents Required
(i)	Legal Entity	The bidder should be a Private/ Public Limited company registered under the Companies Act, 1956 or a registered firm. The company should be in existence for more than 5 years as on 31.03.2016. The firm should also have their registered office in India preferably in Kolkata/Delhi/Mumbai/Chennai/Bangalore/ Hyderabad/Dhanbad. The company must be registered with appropriate authorities for all applicable statutory duties/taxes.	Valid document-tary proof of: • Certificate of incorporation • Copy of Memorandum of Association Valid document - tary proof of: • Central Sales Tax/VAT number. • Service Tax registration number. Income Tax registration/PAN number Audited P/L Copies of last 3 years

(ii)	Mandatory requirement	The bidder should have executed at least one project using the architecture and technologies similar to those being proposed in their quotation against this tender. In addition, the following condition should also be satisfied. At least one order of 80% of tender value or At least two order of 60% of tender value or At least three orders of 40% of tender value	PO copies of all such order have to be enclosed.
(iii)	Net Worth, profitability	a. The bidder should be a profit making organization for at least three years during last five years. b. Solvency certificate of Rs.20 Crores from a schedule bank is required.	Certified copy from the C.A has to be enclosed.
(iv)	Technical Manpower Capability	a. The bidder must have on its roll at least 10-15 technically qualified professionals – B.E. or equivalent in Mechanical / Electrical / Civil with an experience in MEP (Mechanical Electrical and Plumbing) and provide the Data Centre Infrastructure maintenance services as on date of release of tender b. For the design and implementation phase the bidder is required to provide the following levels of resources onsite: • Data Centre Design and IT Expert • Civil Work Expert • Power and Electrical Expert • HVAC Expert • BMS Expert The above onsite resources provided by the bidder must be technically qualified professionals – B.E. or equivalent in Mechanical / Electrical / Civil with an experience in MEP (Mechanical, Electrical and Plumbing) and should have experience in the Data Centre Design and Implementation services as on date of release of tender document. c. These onsite deployed resources should have a minimum experience of 7 years with at least 5 years in a similar data	Certificate from bidder's HR Department for number of Technically Qualified professionals employed by the company, along with their Curriculum Vitae citing their experience.

		centre project, whereas, the support staff should be of a minimum experience of 5 years with at least 2 years in a similar data centre project. d. The successful bidder can also deploy resources who are Diploma or equivalent in MEP (Mechanical, Electrical and Plumbing) with a minimum experience of 9 years with at least 6 years in a similar data centre project e. For the operations and maintenance phase the deployed onsite resources must be B.E. or equivalent in Mechanical / Electrical / Civil with a 3 years experience in MEP (Mechanical, Electrical and Plumbing. The successful bidder can also deploy re-sources who are Diploma in MEP (Mechanical, Electrical and Plumbing) with an experience of 5 years in MEP. f. The bidder should have L2/L3 level service engineers in the relevant field of quoted items. The bidder should have a minimum 1 certified HPC engineer, who should have carried out minimum three 10 TF or above HPC installations and should have experience and complete knowledge of HPC hardware and software used by the users mentioned in the below document and he should be able to provide support to the users24X7X365 remotely and Next Business Day (NBD) onsite support.	Details of the HPC engineers assigned to the projects and their Resume/CV, satisfactory performance letter/ certificate from their Clients, where they have installed HPCs and provide hardware and software support having similar configurations should be enclosed.
(v)	Certifications	The bidder should be ISO 9001:2000 and ISO 14001 Quality certifications from an accredited and internationally reputed / renowned firm.	Copy of ISO certificates

(vi)	Technical Capability	a. During the last five financial years as on date of release of this document, the bidder should have installed and commissioned at least two Data centre projects in India or neighboring nations which should include activities like Design, Site Preparation, Supply, Installation, Testing, Commissioning, Operations and Maintenance of Basic Infrastructure for the establishment of a Data Centre of a Tier III Level. The above projects should be under the Operations and Maintenance phase for at least one year. The bidder should provide details of at least one of the two data centre projects which should be of the following capacity: i. 2,000 sq. ft. server farm area ii. Experience in Supply, Installation, Testing, Commissioning, Operations and Maintenance of Basic Infrastructure iii. Minimum 500 KVA DG power with multiple DG sets and its synchronizing panel, iv. Minimum 200 KVA UPS and PDUs and v. Minimum 75 tones chiller/gas based/modern in-row system with PAHU & high density rack cooling solution b. The bidder should have successfully executed projects at premier Indian Defence organizations or premier Indian Academic and Research institutions like IISc, TIFR, IISER, IIT or institutions of equivalent stature. Bidders should submit the satisfactory performance letter/ certificate from their Clients, where they have installed HPCs having similar configurations. c. The Bidder should submit valid documents of the OEM with which they have already successfully installed the project	Copy of work orders for minimum two data centre projects supported with relevant documentary evidences for the design parameters as mentioned in criteria and the completion certificates by the client. Self-declarations will not be entertained. For bidders who have built their data centre for commercial use will need to provide relevant documentary evidence like Certificate from Company Audi-tor/Company Secretary confirming the order value, supported with relevant documentary evidences for the design parameters as mentioned in the criteria. Such evidences will also require client certificates stating the kind of services delivered and their satisfaction on

		OEMs include: UPS Chiller PDU PAHU/ Row Based Cooling Fire detection and Suppression Surveillance VC and Smart Class room Components IT Active and Passive Components Any other Note: • Bidder's in- house data centers shall not be considered • Bidders who have built their own Internet Data Centre ('IDC') for commercial use will be considered	these services.
(vii)	HPC qualifying Criteria	a. High Performance Computing Cluster The bidder should carry out below listed benchmark programs on 5TF, 10TF and 20 TF peak performance configurations of the offered solution and also produce the extrapolated outputs of the fully offered solution in peak performance configurations. Benchmark codes can be run on the Intel Xeon Has well architecture and the extrapolated results can be submitted. However, the produced results should match with the results of the offered solution as a part of the acceptance test. The maximum allowable deviation from the extrapolated results in the acceptance test should be less than 2%. The results (with TFLOP count where applicable) should be presented in an output file and included in the technical bid. Demonstration of High Performance Linpack (HPL) Benchmark performance of minimum 85%. Other applications for Benchmark – LAMMPS, P3DFFT, GROMACS.	Supporting documents need to be enclosed The document should stating the kind of services delivered and their satisfaction with client address and contact details

		Download the benchmark from this page: (www.iitism.ac.in/computer-centre/ccdc.html) a. 100 TB Storage Solution All storage controllers/nodes must support Linux based operating system. Must support NFS (version3 and above), CIFS protocols. Open source IO Zone or IOR must be used to demonstrate aggregate performance of the storage system. They must be run with many to one distribution of large sequential read and write of 1MB I/O block size. Benchmark must be run in the following modes with data size twice that of the node memory: All controller & disk LUNS working; At least one RAID6 LUN is in rebuilding mode; Performance in both scenarios should not differ by 25%. Provide output of the above benchmark on DVD/CD along with the bid. Do not provide the print out of the outputs. Proposals of vendors who do not fulfill the above criteria or who fail to submit documentary proof would be rejected.	
(viii)	OEM Criteria	All warranty and support must be serviced directly by the OEM. Local presence of OEM's support centre, preferable in Kolkata/Delhi/Ranchi/ Dhanbad/ Jamshedpur.	Supporting documents need to be enclosed
(ix)	Blacklisting	Applicants must not be under a declaration of ineligibility for corrupt and fraudulent practices issued by Govt. of India/ State Govt.	Affidavit duly notarized to be submitted
(x)	Consortiums/ JV	Consortiums/JV bidding is not allowed. The bidder shall be the single point of contact and shall be solely responsible for all warranties and upgrades etc.	An undertaking by the bidder duly signed by the authorized signatory.

Brief Scope of Work

The scope of work involves Design, Site preparation, Supply, Installation, Testing, Commissioning, Operations and Maintenance of Basic infrastructure for the establishment of a Computer Centre cum Data Centre with 20 TF HPC cluster on a Turnkey basis.

The following table indicates the scope of work in a broader perspective.

Sl. No.	Work Head	Scope
(i)	Data Centre – General Requirements	Designing and Implementing the relevant areas of the Data Centre keeping in view the following attributes: • Availability • Flexibility • Scalability and • Modularity The bidder must ensure that the design generally meets the following industry standards for Tier III or above classifications: • ASHRAE's cooling standards • IEEE standards for Electrical • TIA 942 for Data Centre • NFPA, UL and local fire codes for Safety and security • ISO standards for processes and procedures. The currently prevailing infrastructure in the OLHC should be used to the extent possible after assessing their reusability keeping in view the recommendations of the Tier III Data Centre. Wherever additional infrastructure is required, the bidder shall quote for the following heads. The Data Centre shall follow high-efficiency design in equipment type / capacity selection to achieve high overall operational efficiency at optimized expenses. As a measure of overall Data Centre efficiency, bidders shall present a measurable index that clearly gives the

		ratio of power used by IT equipment versus total power requirement to support the Data Centre operations. The design of the Data Centre passive infrastructure shall comply to the requirements of the Uptime/TIA 942 Tier – III Requirements. Each and every capacity components and Distribution paths shall be concurrently maintainable. Hence redundant capacity components and redundant distribution paths shall be incorporated in the design
(ii)	Civil Work	The Data Centre shall be designed in a modular fashion such that it is able to scale up with the IT hardware deployment progressively and Technology up-gradation. Tentative IT load details are captured in subsequent sections. It would cover the following tasks (wherever applicable), with an assurance that if any area being dug/drilled/chiseled etc. then it should be maintained back properly to aesthetic looks: • Cement Concrete work (if necessary) • Cutting & chipping of existing floors • Trench works • Masonry works • Plumbing work • Drainage system • RO Unit for drinking water • Toilet modification • Hardware and Metals • Fire rated Glazing and partitions • Paint work • False Flooring (entire Centre area) • False Ceiling (entire Centre area) • Furniture & fixture

		• Partitioning • Doors and Locking • Fire proofing all surfaces • Insulating • Vitrified Tiles • Modular Workstations, dust proof carpets etc. Entire Data Centre and additional supporting Rooms are located in the Ground floor of OLHC and physically divided as rooms as per FIGURE–I. Internal and External restructuring and refurbishment may need to offer complete solution. Presently those areas are using for Office and Classroom purposes. The bidder has to offer complete solution without change the structure of the existing building. Bidder should propose different zones for the following: One zone for server room which host servers racks, Network racks, Cooling units, Comfort cooling units, UPS output PDUs Second zone for NOC room that designed for 8 seaters with 2 numbers of Large Video Display units. It also comprises a BMS room with panels for IBMS systems, Fire suppression cylinders with 2 workstations. All Network Connections from outside will terminate here. Third zone comprises of Electrical/UPS room and Battery room that are designed with Data Centre Panels, UPS and Batteries etc. The same shall be constructed adjacent to the existing infrastructure optimal use of the adjacent areas. Fourth zone for outdoor units viz., Engine Alternators, proposed Chiller units etc. to be located near the Data Centre area. Fifth zone for auditorium, lab and classroom unit for video conferencing, smart class etc. These zones are indicative only. Bidders should propose the optimal design for the Computer Centre cum Data Centre fulfilling all requirements. The solution should offer best utilization of infrastructure and the effective delivery of services.

(iii)	Closed Loop Cooling	High performance Closed loop cooling units are required for DC Server and Network racks
(iv)	Air-conditioning	The bidder would have the responsibility of maintaining adequate temperature (even during power outage) in all the areas of the Data Centre keeping in mind the energy efficiency. Precision Air-Conditioning System (for DC, NOC, UPS / Electrical room etc.)
(v)	Electrical Distribution of Mains, Lighting, LT panels, UPS Power and Generators	EB sources available with IIT (ISM) Dhanbad may be taken /tapped with necessary retrofitting work as per the standard practice. All the electrical requirement of the Data Centre area shall meet Tier III, Concurrent maintainability Architecture which includes following requirements: • DG Sets needs to be proposed in N+N redundancy • UPS shall be proposed in N+N redundancy with 15 minutes back up on full load condition • Data centre main panels shall be installed in N+N redundancy All the electrical requirement of the Data Centre area has to be taken care of as per Tier III standards of TIA 942 which includes following requirements: • Separate Earth pits for components – Copper plate earthing • Copper Earth Electrodes & Earth strips • UPS Distribution Board with MCBs, ELCBs (various ratings) • N + N UPS solution with concurrent maintainability. • All types of Power Cabling and Bus Trunking System • All output distribution points (including 3-Phase NEMA connectors etc.) • Cables & end Terminations • Sub/Circuit Mains • Data Centre Lighting (including Emergency lighting) • Power Usage Effectiveness i.e., PUE should be less than 1.5 at full load and 1.6 at 50% load. • Data center Infrastructure Efficiency DCiE >= 56%

(vi)	Network Operation Centre (NOC)	This facility involves setting up a NOC with following requirements: • Should have a Large Video Wall Display units • The same display shall preferably be used for monitoring, conferencing between the Main and the other DR site in future • Provision for putting 10 Workstations • The N/W points should be brought to Desktop Workstations
(vii)	Data Centre Classification	The Data Centre shall conform to the guidelines given byTIA942 and/ or Uptime institute for at least Tier III and shall be targeted towards: • High Physical Security, Reliability, Availability, Scalability, Manage ability and Interoperability Wherever the specifications given in this document deviates from the guidelines given by TIA942 or Uptime Institute, the same shall be brought to the notice of IIT (ISM) Dhanbad. It is highly desirable that the bidder should guide, prepare and obtain the requisite documents for Data Centre auditing and obtaining certification by the authorized agencies for Tier III classifications before sign off the project.
(viii)	DCIM (Data Centre Infrastructure Management System)	DCIM shall provision the Operations and Maintenance of entire Data Centre infrastructure
(ix)	Building Management System(BMS)	The Integrated BMS should include the following components: Software Addressable Fire Alarm System
(x)	Auditorium for Smart Class and VC	Display and Video System Ceiling mounted projector 5500 Lumens, WUXGA H Base T Projector, 123" Diagonal screen,16:10, 55" presentation display, HDMI matrix switcher systems with requisite connections / transmitters receivers for signal flow Video Conference System Full HD Video Conferencing solutions with dual camera

		support Audio System 1 gooseneck mic, 2 Handheld mic, 1 collar and 1 head worn mic, wireless microphone antenna system, Multichannel audio DSP with AEC, Dual channel power amplifier, Line array column speakers AV Control System AV control system using IPAD touch screen Bulk Cables and Connectors Branded bulk cables, connectors and accessories with equipment rack Provision for putting Desktop/Laptop with all electrical and network cable points in front of each sitting area. Design, Installation, Commissioning with all prerequisite furniture for the complete solution.
(xi)	Physical Security (Access Control), Firefighting etc.	LASER Aspiration System for early smoke detection FM1230 based Fire Suppression System Access Control System involving- o Closed Circuit Television System(CCTV) o Biometric and Proximity Card o Attendance Management System o Alarm System Rodent Repellent System Water Leak Detection System
(xii)	HPC Cluster Specification	**ITEM 1: Master Node: 1 No** ▪ 2 * Intel Has well 18C E5-2699V3 2.3GHz 45M ▪ Two sockets per node. ▪ Memory of 8 GB/core DDR4-2133 RAM. ▪ 4Xminimum 500 GB Enterprise Hard Disk SAS @ 10000 rpm or better with RAID 10 Configuration. ▪ 1 Management port ▪ Redundant power supply ▪ 1 x DVD Writer ▪ Connectivity as per requirement in ITEM 5.

ITEM 2: Compute Nodes: 30 Nos

- 2 * Intel Has well 18C E5-2699V3 2.3GHz 45M
- Two sockets per node.
- Memory of 4 GB/core DDR4-2133 RAM.
- 1X500 GB SATA Hard Disk @ 7200 rpm or better
- 1 Management port
- Redundant power supply
- Connectivity as per requirement in ITEM 5.
- 16 No's of NVIDIA Tesla K40 GPUs should be populated across the nodes with minimum of two GPUs per nodes.

Note:

- OEMs/Bidders to contact NVIDIA to offer Academic pricing on GPUs
- Redundant Power Supply can be in the compute node level OR Enclosure level or Rack level

ITEM 3: NAS Storage

- 100 TB usable capacity storage on NL-SAS or better with inbuilt controller and Hardware Requirement RAID 6 (8 + 2) storage array.
- Maximum of 2 TB capacity 7.2K RPM NL-SAS or better disks to be used.
- Global Hot Spare Disks: Disks amounting to 5% of total capacity to be provided as Global Hot spare (i.e., Global Hot Spare for every 2 LUN in RAID 6)
- Storage Throughput – Minimum 2GB/s write speed from compute nodes.
- Storage nodes & Management nodes should be connected with KVM switch and display.
- Open-source IOR/IO Zone benchmarks running on compute nodes with 1MB block size and file size double than total storage cache and I/O node memory.
- Benchmarks should be submitted with the technical bid with I/O measured from client (compute node) using IOR benchmark for 2 GB/s write throughput.
- High Availability should be automated.
- Failover and MMP (Multiple Mount Protection) should be

		configured. ▪ Mounting and un-mounting of the file system should happen without error. ▪ User quota and group quota should be configurable. ▪ Storage system should be scalable up to 200 TB in single file system by addition of hard disks only (without additional controllers being required). **OPTIONAL (Parallel File System)** ▪ Quote separately for a 200 TB open source parallel file system based storage solution with 5 GB/s throughput for the cluster solution. (optional, but quote compulsory) ▪ 200 TB usable capacity storage on NL-SAS or SAS with Hardware Requirement RAID 6 (8 + 2) storage array. ▪ Storage to be split into two silo's in a 25:75 ratio wherein 25% of storage is required to deliver minimum 5 GB/s write throughput. The remaining 75% is required to delivery minimum 3 GB/s write throughput. Read performance should not be less than write. ▪ Minimum of 2TB capacity 7.2K RPM Enterprise NL - SAS disks to be used. ▪ Parallel File system (PFS) should be Intel sourced and OEM supported Lustre or equivalent or better open source PFS. The solution should be highly available and with no single point of failure including I/O servers, Metadata servers, Storage array, HBA Cards and power supply. ▪ Meta Data Targets (MDT) in RAID 10 and Object Storage Targets (OST) in RAID 6 (Hardware RAID). (8 + 2) configuration. ▪ Global Hot Spare Disks: Disks amounting to 5% of total capacity to be provided as Global Hot spare (i.e., Global Hot Spare for every 2 LUN in RAID 6) ▪ Storage Throughput – Minimum 5GB/s write speed from compute nodes. ▪ Meta data should be stored in a separate storage enclosure, which is connected to the MDS Server. ▪ OST should be in separate storage enclosure/s, which is/are connected to the OSS Server. ▪ MDT Hard Disk should be on SAS 10000 rpm or higher. ▪ Storage nodes & Management nodes should be

		connected with KVM switch and display. ▪ Open-source IOR/IO Zone benchmarks running on compute nodes with 1MB block size and file size double than total storage cache and I/O node memory. ▪ Benchmarks should be submitted with the technical bid with I/O measured from client (compute node) using IOR benchmark for 5 GB/s write throughput. ▪ Wire speed Infiniband connectivity between Storage servers to Storage enclosures with Redundant Connects & Links. ▪ MDT should be mounted only with MDS server. ▪ OST should be mounted only with OSS servers. ▪ For MDT Failover, MDS Nodes should be configured with active/passive pair. ▪ For OST Failover, OSS Nodes should be configured with active/active pair. ▪ High Availability should be automated. ▪ Failover and MMP (Multiple Mount Protection) should be configured. ▪ File system should not go down, even if one of the MDS or OSS nodes fails. ▪ Mounting and un-mounting of the file system should happen without error. ▪ File server should be scalable up to 600 TB in single file system by addition of hard disks only (without additional controllers being required). **ITEM 4: System Software** ▪ Job Scheduler can be open source. ▪ Resource Manager can be open source with integrated workload managers. ▪ The HPC servers should be clustered together through open source clustering tools. Preferred clustering tool - xCAT (https://xcat.org/), open HPC ▪ Operating System - latest stable open source Cent OS Linux ▪ Open source scheduler - Preferred PBS Pro (Open source)(http://www.pbsworks.com/opensource) or SLRUM ▪ Modules support for maintaining multiple versions of softwares. All softwares should be configured with module environment. (http://modules.sourceforge.net/)

		▪ All specified solutions and required software products must be clearly listed with mode of licensing used and number of licenses required including the period of validity and any maintenance or upgrade applicable. ▪ Restrictions on software usage, if any, should also be indicated. ▪ PERPETUAL LICENSE is required for all these softwares. Note: ▪ All the software deployment will be in vendor's scope of work and vendors are requested to include any software deployment charges in their proposal ▪ The Master, compute and storage nodes should be dense rack form factor designed for cluster solution and should be in the lowest foot print and the lowest power consumption ▪ User Code Optimization is integral part of the contract. **ITEM 5:Network/Interconnect** ▪ Network should be fully non-blocking interconnect fabric, with QDR/FDR/Omni-path/equivalent-or-higher (in terms of bandwidth), Chassis switch with redundant power supply and redundant fan, HBA cards, cables, etc. ▪ Management switch (managed Gigabit LAN switch) ▪ Management modules in IB switch should be redundant. ▪ Master /Head /Login node has to have at least 4 x 1 Gbps NIC for LAN connectivity. ▪ All nodes to be connected by Gigabit network for administrative works. ▪ All Network/Interconnect cablings must be structured and adhere to ANSI/TIA – 568 standard. **ITEM 6:1U KVM module with IP over KVM switch 01** ▪ 1U Rack mount KVM Console LCD Monitor 103 key keyboard and integrated Touch Pad ▪ IP Module for KVM ▪ Built-in Rail Self-locking device support combo (PS/2 & USB) interface for connecting computer ports conveniently ▪ KVM over IP switch with virtual media support1-

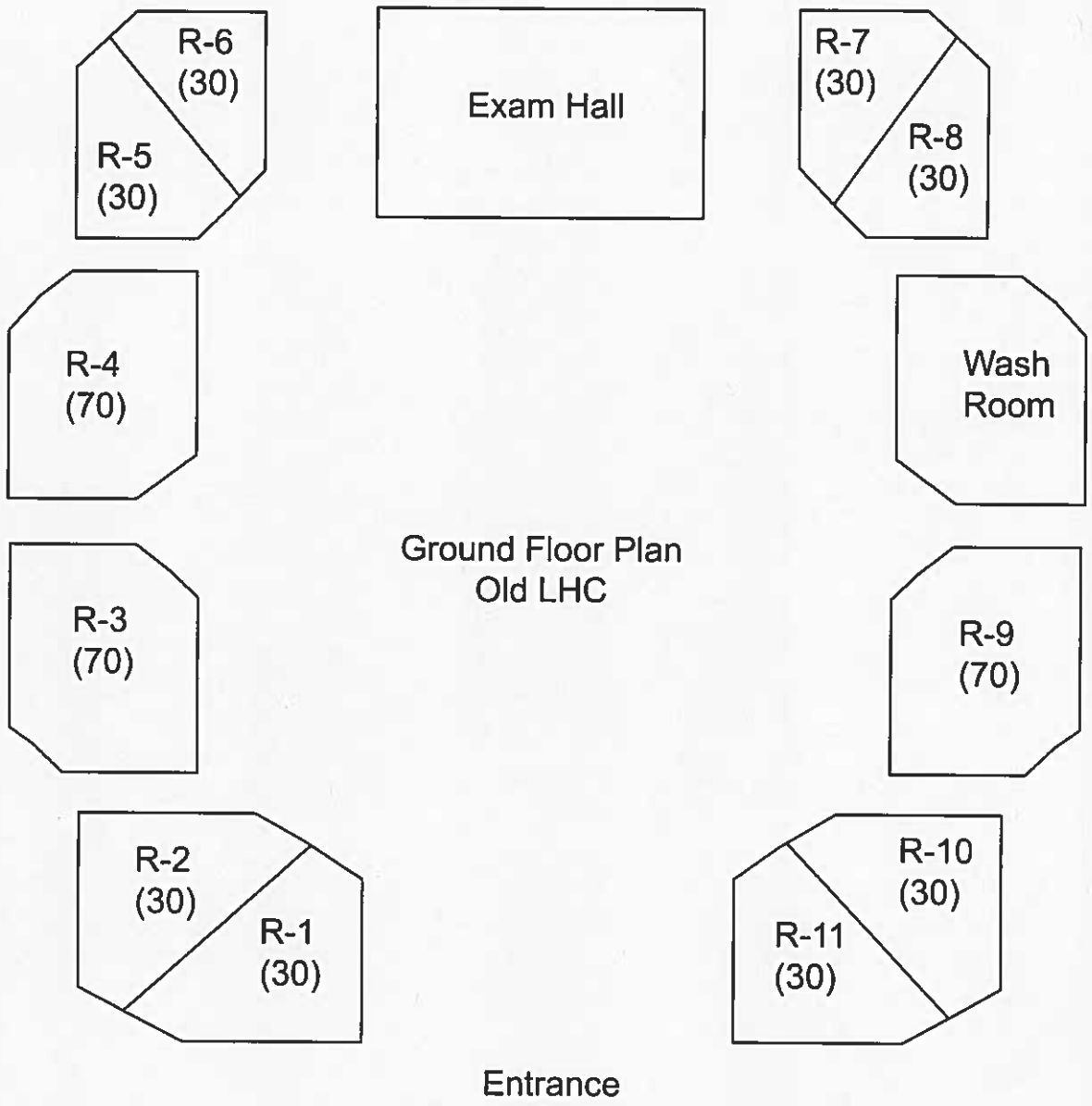
		Local/2-RemoteAccess Console Ports ▪ 2x USB Female, 1x DVi-D Female 1x VGA HDB-15, 1x RJ-45Female ▪ USB Port: Minimum 3x USB female multi-browser support: IE ,Chrome, Firefox, safari, Opera, Mozilla, Netscape multiplatform client support (Windows, Mac OS X, Linux, Sun) ▪ KVM ports: Minimum 32 RJ-45 Female (Cat 5 support), Virtual media (1920x1200) ▪ Dual Power Supply ▪ Two 10/100/1000 Mbps NICs for redundant LAN or two IP Operation ▪ USB VGA Virtual media KVM adapter ▪ Connectors: As required ▪ Link: 1x RJ-45 Female ▪ Computer: 1x USB Type A male, 1x HDB-15 male ▪ QTY of adapters may be increased/decreased based on actual requirement **ITEM 7: Rack** ▪ Server/ OEM Rack (42U) suitable for quoted server and storage. **ITEM 8: Software Applications that will be run:** ▪ FFTW, P3DFFT, GERRIS,, LAMMPS, QUANTUM ESPRESSO, NAMD, GROMACS etc., ▪ Scientific programs: Python, Numpy, SciPy, Setuptools, IPython, pythondev, pythonnumpy, pythonmatplotlib, pythontk, pythonlxml, PyReadline, MDAnalysis. ▪ Vim, Gvim, GNU plot, NTPD, GRACE, BC, VMD, Perl, etc., ▪ Vendors should keep the system ready for commercial software like Matlab, Mathematica, Comsol, Gaussian(g9 or above) etc. **Compilers and Libraries** ▪ Open MP, MPI, C/C++ and FORTRAN compilers should be installed. ▪ 4 No's of PGI Open ACC compiler (Academic version)

		including FORTRAN should be installed. (Vendors should contact NVIDIA for academic version Open ACC compiler and license) **Cluster management tool** ▪ Web-based application for supercomputer access. Platform independent interface (Windows/Unix/Mac). GUI monitor should support all browsers. ▪ User account management from master node. ▪ Monitoring tool like Nagios or better, integrated with Environment values, Load, Resource status, system environment status, Hard Disk usage status and hardware configuration. ▪ PDSH, Generating Host Keys for users and PDCP should be configured. ▪ Users' home directory should be in file system with quota enabled. ▪ Reimaging new nodes (CPU) from master nodes. ▪ Integration of all software components so as to make the complete HPC cluster system fully functional and usable (e.g., integration of the scheduler with MPI, any license managers, etc.). ▪ Detailed reports about cluster usage statistics. Reports of every user and jobs including their monthly usage, node usage, percentage of utilization, History tracking, number of completed, failed, queued and running jobs; estimated delay and average job duration. ▪ Automated health check of nodes and Urgent alert messages about critical errors via SMS/E-mail. ▪ IPMI and Ganglia should be installed and configured for GUI based monitoring for cluster management. **Job/Work load management** ▪ Jobs can be submitted from master node only. ▪ CPU enabled scheduling with checkpoint and restart. ▪ Job scheduler configuration including new/delete/disable queues. ▪ Dynamic Resource Management and Resource balancing. ▪ Policy based resource allocation.

		▪ Configure job scheduler for script less (short command line) submission of jobs on master node. ▪ Job status monitoring, Job history ▪ Usage accounting & reporting with total utilization of resource. ▪ Check runaway process before entering new jobs. **Note:** Proposed job/work load management tool should be open source, which should meet 7 out of 9 criteria mentioned above. Quote separately for a job/work load management tool which fulfills all the above mentioned requirements. It can be commercial (Optional, Quote Compulsory). **Firmware** All hardware should be installed with recent stable version of firmware. **ITEM 9: Warranty and Support** ▪ Cluster management and support for (3+1+1) years – o Training for general system administration with documentation including tasks such as user/node management, installation/upgrade, queuing system management and file system management. o Two L2/L3 level trained personnel having 5 years or more experience in similar project should be available to help at any time in person at IIT (ISM) Dhanbad. o Technical support for administration/maintenance (both software and hardware levels) of HPC. Vendor will be responsible to protect data during any upgrades of firmware/OS. o A helpdesk email account that is regularly monitored should be available to the users. o An escalation matrix for issues not resolved by the support personnel, with an expected time line, should be clearly mentioned. o The person should have enough experience to handle cluster hardware and software troubleshooting to resolve the problems faced by the users. This should include fine-tuning of the scheduler's various capabilities.

		○ The person should be able to produce required status report of the cluster when asked using the software installed in the cluster to manage it. ○ Faulty parts should be replaced within 48 hours of logging a call. ▪ Hardware warranty for (3+1+1) years. ▪ 3-years of on-site comprehensive warranty. Mention Annual Maintenance Contract (AMC) Charges for 4th & 5th years separately (Optional, Quote Compulsory). **ITEM 10: Documentation** ▪ User Creation/Deletion/Modification. ▪ Bringing up and shutting down the cluster. ▪ Disk status monitoring of Master/IO nodes and storage enclosure. ▪ Basic troubleshooting for storage and job scheduler. ▪ Step by step installation guide for node configuration from scratch. ▪ When handing over the cluster the vendor should provide the full design of the cluster installation including the electric connections, network connections, user manual clearly explaining how to use the cluster.
(xiii)	Others	**Any Other related items missed out above may include in the bid for the complete solution by all means.**

FIGURE-1


R-6
(30)
R-5
(30)
Exam Hall
R-7
(30)
R-8
(30)
R-4
(70)
Wash
Room
Ground Floor Plan
Old LHC
R-3
(70)
R-9
(70)
R-2
(30)
R-1
(30)
R-10
(30)
R-11
(30)
Entrance

Information sheet to be filled by the Bidder

The details filled in these forms must be accompanied by sufficient documentary evidences, in order to verify the authenticity and correctness of the information.

Table-1

1.	Name of Firm	
2.	Address	
3.	Phone & Fax No.	
4.	Email address	
5.	Website address, if any	
6	Registration number &Year o Registration	
7	Central Service Tax	
8	VAT/Service Tax No.	
9	PAN No.	
10	Mandatory requirement	
11.	Income Tax Paid during financial years2013-14, 2014-15,2015-16	
12.	Details of the ownership of the Firm (Name of directors etc.)	
13.	Name of the Authorized signatory, who is authorized to quote in tender and enter into rate contract(Power of attorney to be submitted)	
14.	Name of the bankers along with branch (as appearing in MICR Cheque) & Account no.	

Date:_____

Place:_____ Signature with Seal