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GeM ARPTS: GEM/GARPTS/12032021/06IAC8PN436N dated 12-03-2021

Tender No. IITPKD/PRJ/SRM/79/2020-21
Date of Publication: 30-03-2021
Date/Time of Closing: 20-04-2021, 1500 hours

Indian Institute of Technology Palakkad Invites Tender under Two-bid system for the:

SUPPLY, INSTALLATION,TESTING AND COMMISSIONING OF Hybrid Propulsion Underwater Robotic Vehicle for Ocean Observations

Conforming to the specifications as in **Annexure-I**.

Tender Documents may be downloaded from the e-Wizard Portal https://mhrd.euniwizarde.com/. Aspiring Bidders who have not enrolled / registered in e-Wizard should enroll / register before participating through the website https://mhrd.euniwizarde.com/. Bidders are advised to go through instructions provided at **"Procedure for Submission of E-tender".** [Special Instructions to the Contractors/Bidders for the e-submission of the bids online through this e-Wizard Portal"].

Bidders can access tender documents on the website. For searching in the site, kindly go to Live Tenders option, Click "Advance Search" and select Department as 'IIT Palakkad'. Thereafter, Click on "Search" button to view all IIT Palakkad tenders. Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website https://mhrd.euniwizarde.com/as per the timeline below.

No manual bids will be accepted. All tender documents including Pre-qualification, Techno-Commercial, Technical and Financial bids should be submitted in the e-Wizard portal.

S. No.	Events	Date and Time
1	**Publication of the Tender Document**	**30-03-2021**
1	**Last Date/Time for submission of ONLINE Bids**	**20-04-2021, 1500 hours**
3	**Opening of Technical Bids**	**20-04-2021, 1515 hours**

RAMESH S Digitally signed by RAMESH S
Date: 2021.03.30 22:28:10 IST

TERMS AND CONDITIONS

1	**GENERAL**	(a) The responsibility of submission of the bids on or before the last date shall rest with the tenderer. The institute will hold no responsibility for the non-receipt of the bids or the bids received after the date/time specified. Any bid received by IITPKD after the bid submission deadline prescribed by IITPKD, shall be rejected and returned unopened to the Bidder. (b) Canvassing or offer of an advantage or any other inducement by any person with a view to influencing acceptance of a bid is an offence under the Laws of India. Such action will result in the rejection of bid, in addition to other punitive measures. (c) Each bidder shall submit only one bid, either by himself or as a partner in a joint venture or as a member of the consortium. If a bidder or if any of the partners in a joint venture or any one of the members of the consortium participate in more than one bid, the bids(of both the individual and the partnership/consortium/joint venture) are liable to be rejected. (d) The bidder shall bear all costs associated with the preparation and submission of his bid and IITPKD shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the tender process. (e) **IITPKD will respond to any request for clarification or modification of the Tender Document that are received up to TWO DAYS prior to the deadline for submission of bids prescribed by IITPKD. For this purpose, the prospective bidder(s) requiring clarification in the Tender Document shall notify IITPKD through the ONLINE Portal ONLY. Any such clarification, together with all the details on which the clarification had been sought, will be published in the ONLINE Portal ONLY. Deviations, if any, observed by the Institute in the submitted bids, from the Terms and Conditions of the Tender Document will not be accepted by the Institute.** (f) Except for any such clarification by the Institute, which is expressly stated to be an addendum to the tender document issued by the Registrar, IIT Palakkad, no written or oral communication, presentation or explanation by any other employee of any of the Sections/Departments of the Institute, shall be taken to bind or fetter the Institute.
2	**AMENDMENTS IN THE TENDER DOCUMENT**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/01AmendmentstotheTenderDocument.pdf**
3	**COMPOSITION OF THE TENDER DOCUMENT**	(a) The Tender Document comprises of: Instruction to the bidders including terms and conditions 1) Technical Specifications (Annexure-I) 2) Format for Self-Certificationunder Preference to Make in India (Annexure-II) 3) Bid Security Declaration Form (Annexure-III) 4) Undertaking by the Bidder (Annexure-IV) 5) Fall Clause Notice Certificate (Annexure-V)

		(b) The bidder is expected to examine all instructions, forms, terms and conditions in the Tender Document. In the event of discovery of any missing pages, the bidder shall inform the same to the Section/ Department concerned. Failure to furnish the information required by the Tender Document or submission of a tender not substantially responsive to the Tender Document in every respect will be at the bidder's risk and may result in rejection of the bid. (c) The bidder shall not make or cause to be made any alteration, erasure or obliteration to the text of the Tender Document.
4	**LANGUAGE/FORMAT/SIGNING OF THE BID**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/02LanguageFormatSigningoftheBids.pdf**
5	**DOCUMENTS COMPRISING THE BID**	(a) The Technical and Commercial Bids shall be submitted **ONLINE** through the portal mentioned as Cover One and Cover Two. (b) Bids submitted in any mode other than ONLINE will be rejected outright. (c) Documents establishing the conformity of the terms and conditions of the Tender Document shall be provided along with the bid. The offer/bids should be sent only for a system or that is available in the market and supplied to a number of customers. A list of customers in India and abroad with details must accompany the quotations. Quotations for a prototype machine will not be accepted. (d) Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid. No prices should ever be included in the Technical bid. (e) Compliance or Confirmation report with reference to the specifications and other terms and conditions should also be obtained from the principal. (f) Information related to the agency/bidder such as photocopies of the Registration/PAN/GST/TIN shall be furnished. **(g)** The technical bid should consist of all technical details along with commercial terms and conditions. **No prices should be included in the technical bid. Mentioning of Prices in the Technical Bid shall lead to <u>DISQUALIFICATION.</u>** (h) 1. Bidders who are bidding for this tender shall have implemented at least one (supply, integration, and installation of the marine or equivalent mechanical products) ocean/marine related project or similar orders of **Hybrid Propulsion Underwater Robotic Vehicle for Ocean Observations** during previous or current financial year to any of the reputed firms/Institutions, preferably to centrally funded technical institutes (CFTI) institutes or Research institutes in India. Copies of the most recent purchase orders and certificates of successful implementation must be included. 2. Have an cumulative Turnover of **Rs. 25,00,000/- (RUPEES TWENTY FIVE LAKH ONLY)** during the last THREE financial years. The bidder shall enclose the audited statements of the indicated financial years, which should have been certified by a Chartered Accountant or a Competent Authority. (i) Digitally signed Tender Document should be submitted in Cover One.

6	**EARNEST MONEY DEPOSIT (EMD)**	(a) The bidder shall furnish, as part of the technical bid, **Bid Security Declaration Form**as per the **Annexure-III.** **(a) Bids not accompanied by Bid Security Declaration Form shall be DISQUALIFIED.**
7	**PERFORMANCE SECURITY**	(a) The performance security shall be submitted within **FIFTEEN DAYS** of receipt of the material by the IITPKD. The successful bidder shall furnish the Performance Security equal to **3%** of the order / contract value (excluding the value of annual maintenance charges). The Performance Security shall be valid all along the warranty period and shall extend upto sixty (60) days after the date of completion of warranty period. It shall be ensured by the successful bidder that the validity of the Performance Security submitted is extended depending on the date of commencement of the Warranty. (b) The performance security shall be a bank guarantee issued by the Scheduled/NationalizedBank approved by the RBI or a Demand Draft favoring, INDIAN INSTITUTE OF TECHNOLOGY PALAKKAD payable at PALAKKAD. (c) The performance security shall automatically become null and void once all the obligations of the Supplier under the Contract have been fulfilled, including, but not limited to, any obligations during the Warranty Period and any extensions to the period. The performance security shall be returned to the Supplier not later than fifteen (15) days after its expiration. (d) Failure of the successful Bidder to comply with the requirements shall constitute enough grounds for the annulment of the award and forfeiture of the EMD, in which event the IITPKD may make the award to the next lowest evaluated bid submitted by a qualified Bidder or call for new bids. Please click the following link for the Format of Bank Guarantee: **https://iitpkd.ac.in/sites/default/files/purchase/11FormatofBankGuarantee.pdf**
8	**BID PRICES AND CURRENCY**	(a) Prices must be quoted separately for each equipment/items identified. (b) Price quoted for equipment/items must include all costs associated with packing, transportation, insurance, delivery of equipment/items, taxes (separately), loading and unloading on DOOR DELIVERY basis to the institute including its installation, commissioning, integration and validation. (c) Prices quoted by the bidder shall be fixed during the validity of the bid. **(d) Prices of the equipment/items shall be quoted in Indian Rupees (INR) only.**
9	**CONFORMITY OF THE TENDER DOCUMENT**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/03ConformityoftheTenderDocument.pdf**
10	**PERIOD OF VALIDITY OF BIDS**	(a) Bids shall remain valid for a period of **180 DAYS** after the date of the deadline for submission of bids prescribed by IITPKD. (b) If the deadline is extended due to unforeseen circumstances, the bid validity shall be deemed to have extended accordingly.

11	**MODIFICATION AND WITHDRAWAL OF BIDSPURCHASER'S RIGHT TO ACCEPT/REJECT BIDS**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/04ModificationandWithdrawalofBids.pdf**
12	**OPENING,EXAMINATION, CLARIFICATION AND EVALAUTION OF BIDS**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/05OpeningExaminationClarificationandEvaluationofBids.pdf**
13	**SUPPLIER'S RESPONSIBILITIES**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/06Supplier%E2%80%99sResponsibilities.pdf**
14	**TIME FOR SUPPLY, INSTALLATION, COMMISSIONING AND VALIDATION OF THE EQUIPMENTS/ITEMS**	(a) The Supplier shall supply the equipment/items within the period specified in the tender document i.e. within TWENTY FOUR weeks of signing the purchase order or within the period mutually agreed between IITPKD and supplier. All the equipment and accessories should be delivered at **"Nila Campus, IIT Palakkad".** (b) The Supplier shall thereafter proceed with the installation, commissioning, integration and validation and demonstrate operational acceptance of the equipment/items within the period specified. The equipment/items shall be installed and commissioned by the successful bidder within 20 to 25 days from the date of its receipt. (c) The tenderer should indicate clearly the time required for delivery of the item. In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied. (d) In the event of failure of supply of the item/equipment/items within the stipulated delivery schedule, IITPKD has all the right to purchase the item/equipment/items from other sources on the total risk of the Supplier under the risk purchase clause.
15	**TERMS OF PAYMENT / TAX AND DUTIES**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/07TermsofPaymentTaxesandDuties.pdf**
16	**PRODUCT UPGRADES**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/08ProductUpgrades.pdf**
17	**PENALTIES**	(a) If the Supplier fails to complete any of the activities in accordance with the time specified for it, or any extension of time granted by IITPKD, the Supplier shall pay to IITPKD, penalties at the rate specified in the Tender Document. (b) IITPKD reserves the right to terminate the contract if the Supplier defaults on any of the time limits by more than FOUR weeks.
18	**DEFECT LIABILITY**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/09DefectLiability.pdf**
19	**INTELLECTUAL PROPERTY RIGHTS, WARRANTY AND INDEMNITY**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/10IntellectualPropertyRightsWarrantyandIndemnity.pdf**
20	**UP-TIME GUARANTEE/ DOWNTIME PENALTY CLAUSE**	(a) The Supplier should provide up-time guarantee of 95% [24 (hours) X 7 (days) X 365 (days)] basis during the warranty period. (b) The Supplier should provide up-time guarantee of 95% (24 hours/day basis) both during warranty. If downtime exceeds the 5% limit, extension of the warranty period will be twice the excess

		down time period.
21	**LIQUIDATED DAMAGES**	If a firm accepts an order and fails to execute the order, in full or part, as per the terms and conditions stipulated therein, it will be open to the Institute to recover liquidated damages from the firm at the rate of 1% of the value of the undelivered goods per month or part thereof, subject to a maximum of 5% of the value of the undelivered goods. It will also be open to the Institute alternatively, to arrange procurement of the required stores from any source, at the risk and expense of the firm, accepted and failed to execute the order according to stipulations agreed upon. This will also entail the removal of the defaulters' name from the approved/registered list of Suppliers.
22	**EFFECT OF FORCE MAJEURE**	(a) If the Supplier is prevented, hindered, or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the IITPKD in writing of the occurrence of such event and the circumstances of the event of Force Majeure within **FIFTEEN DAYS** after the occurrence of such event. (b) The Supplier, when affected by the event of Force Majeure shall use reasonable efforts to mitigate the effect of the event of Force Majeure upon its performance of the Contract and to fulfill its obligations under the Contract, but without prejudice to IITPKD's right to terminate the Contract. (c) No delay or non-performance by the Supplier caused by the occurrence of any event of Force Majeure shall: i. Constitute a default or breach of the Contract; ii. Give rise to any claim for damages or additional cost or expense occasioned by the delay or non-performance. (d) If the performance of the Contract is substantially prevented, hindered, or delayed for a single period of more than **THIRTYDAYS** or an aggregate period of more than **SIXTY DAYS** on account of one or more events of Force Majeure, the IITPKD shall have the right to terminate the Contract by giving a notice to the Supplier.
23	**EXTENSION OF TIME LIMITS FOR SUPPLY AND MAKING OPERATIONAL, THE EQUIPMENT**	(a) The time limit for supply, installation & commissioning, integration & validation shall be extended if the supply is delayed or impeded in the performance of any of its obligations under the Contract by reason of any of the following: i. Any occurrence of Force Majeure; ii. Any other matter specifically mentioned in the Contract; (b) By such period as shall be fair and reasonable in all the circumstances and as shall fairly reflect the delay or impediment sustained by the Supplier. (c) The Supplier shall assist the institute in relocation/shifting of the equipment from the temporary campus to transit/permanent campus at free of cost and by utilizing their resources (for loading, unloading and transportation). Any such relocation/shifting shall be within THREE years from the date of installation of the equipment.
24	**ASSIGNMENT**	The Supplier shall not, without the prior written consent of the IITPKD, assign to any third party, the Contract or any part thereof.

25	**GOVERNING LAW AND SETTLEMENT OF DISPUTES**	(a) The Contract shall be governed by and interpreted in accordance with the laws of India. (b) Any dispute or claim arising out of/relating to this Contract of the breach, termination or the invalidity thereof, shall be settled by the Hon'ble Courts of Justice at Palakkad. (c) The page number should be marked in all pages serially (including all supporting documents enclosed with the tender document) and the declaration for the same shall be submitted by the bidder as in Annexure-IV. (d) IITPKD reserves the right to accept or reject any or all the tenders in part or whole or may cancel the tender at its sole discretion without assigning any reason whatsoever. No further correspondence in this regard will be entertained.
26	**PROCEDURE FOR SUBMISSION OF E-TENDER**	Please visit the following link for details: **https://iitpkd.ac.in/sites/default/files/purchase/12ProcedureforSubmissionofe-Tender.pdf**

AWARD OF CONTRACT

1	**AWARD CRITERIA**	**1.** IITPKD will award the Contract to the Bidder whose bid has been determined to be substantially responsive and **as per the Order No. 45021/2/2017-PP(BE-II) dated 04-06-2020 from Department for Promotion of Industry and Internal Trade (Public Procurement Section), Ministry of Commerce and Industry, Govt. of India.** **2.** The Institute reserves the right to buy different items/quantity from different bidders considering price of individual/group of equipment/items or any other factors as decided by the Committee. The bidder should be a Class-I / Class-II Local Supplier meeting the requirement of minimum 20% Local Content in line with the Public Procurement (Preference to Make in India) Order 2017 No. P-45021/2/2017-PP (BE-II) dated 04 Jun 2020.
2	**AWARD OF PURCHASE ORDER**	1. Prior to the expiration of the period of bid validity, IITPKD will issue the Letter of Intent / Purchase Order to the successful Bidder in writing. 2. Any amendment(s) in the Purchase Order will be permitted within **SEVEN DAYS** of its issuance. No amendments will be permitted beyond this period. 3. The Purchase Order will constitute the foundation of the Contract.
3	**CONTRACT AGREEMENT**	1. Within **SEVEN DAYS** of receipt of the Purchase Order, the successful Bidder shall sign and date its copy on each page and return it to the Purchaser. 2. Copy of Purchase Order duly signed and dated by the successful Bidder on each page shall constitute the Contract Agreement.
4	**CONTRACT DOCUMENTS / AMENDMENT TO CONTRACT**	1. All documents forming part of the Contract (and all parts of these documents) are intended to be correlative, complementary and mutually explanatory. The Contract shall be read as a whole. 2. The order of precedence of the Contract documents shall be as follows: (i) Contract Agreement/Purchase Order (ii) All Forms/Annexures (iii) equipment/items and their requirement (iv) Supplier's Bid (v) Tender Document 3. No amendment or other variation of the Contract shall be effective unless it is in writing, is dated, expressly refers to the Contract and is signed by a duly authorized representative of each party to the Contract.

REGISTRAR

ANNEXURE-I

TECHNICAL SPECIFICATIONS

Introduction

The fabrication, integration and interfacing of subsystems of Hybrid Propulsion Underwater Robotic Vehicle shall operate up-to 3 bar (equivalent to 30m). The hull houses entire mechanical and electrical/electronic components that are required as per the specification given below. The hull would be mounted with caudal (tail) fins and pectoral (chest) fins separately for propulsion and pitching. Both flexible and rigid materials are required as the caudal fin and pectoral fins. The proposed system will operate both in autonomous/semi- autonomous modes with required sensor platforms, to measure various parameters.

There are two buoyancy modules placed at fore and aft of the pressure hull for changing the buoyancy of vehicle. A pitch-roll moving mass mechanism with a linear actuator moves the mass along the axis of the vehicle, whereas the DC servo motor rolls the mass.

The power to all the systems is provided by the rechargeable secondary battery. A controller is used to control the different modes of operation of the vehicle. The controller takes the decision based on the requirement of user or through the preprogrammed codes.

I. Technical Details - Description of the components of underwater vehicle

The major requirements of the vehicle are Mechanical, and Electrical or Electronics.

Mechanical requirements

i. Hydrodynamically stable Fish shaped external hull with fins.

ii. Structural feasibility of the hull and other components (Analysis).

iii. Sealing arrangement for the fin actuation shaft.

Electrical or Electronics requirements

iv. Suitable actuators for the actuation of the fin with low power consumption.

v. Control system for the mission control in autonomous mode (Communication and Navigation).

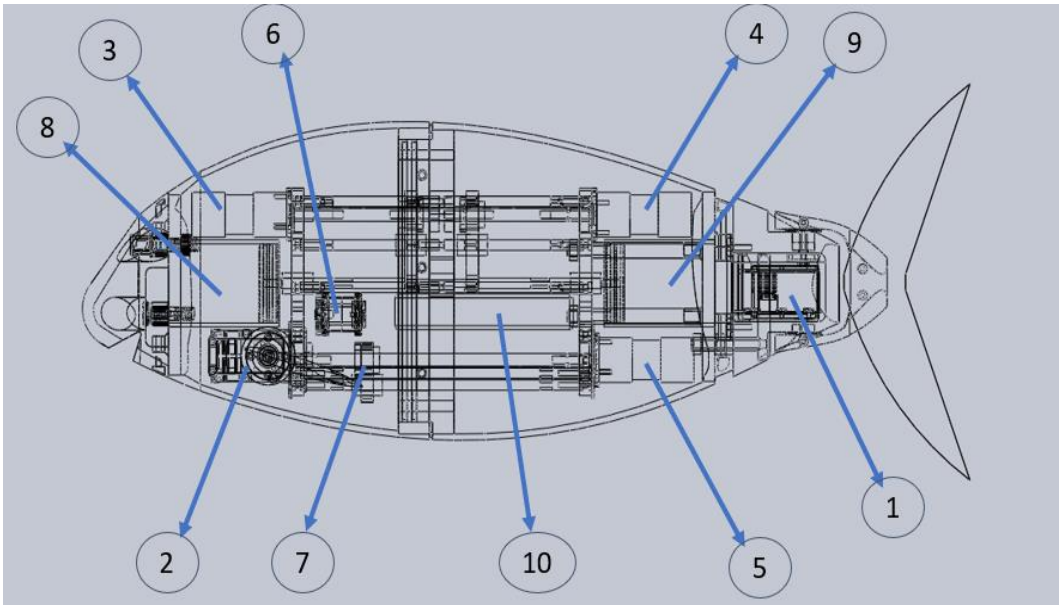

Figure: Wire frame model of underwater vehicle and its components

1	High torque DC servo motor to actuate the caudal fin	6	DC servo motor to rotate the rolling mass to achieve stability in roll axis
2	High torque DC servo motor to actuate the pectoral fin	7	The moving mass
3	High torque DC motor to actuate the buoyancy module in forward part of vehicle	8	The buoyancy module in the forward part of vehicle
4	High torque DC motor to actuate the buoyancy module in aft part of vehicle	9	The buoyancy module in the aft part of vehicle
5	High torque DC motor to actuate the moving mass in longitudinal axis	10	Lithium-ion battery

1. High torque DC motor with optical encoder with compatible motor driver

Two buoyancy control modules are placed at forward, and aft of the vehicle to form a dual buoyancy controlling module for changing the buoyancy. The two buoyancy controlling modules comprise linear actuators to move a pair of plungers in both forward and aft buoyancy modules. The forward buoyancy module is to glide/profile in the water column, and the aft buoyancy module is used for pre-dive autonomous ballasting based on the change in the payload for a particular mission. The linear actuator is actuated using this High torque DC motor.

2. High torque DC servo motor with compatible servo horns and cables and other auxiliaries (with position feedback)

The DC servo motor of the caudal fin is an independent module attached to the vehicle where the caudal fin can be replaced with a thruster of same power output for performance comparison of the thruster-based and the caudal fin-based propulsion under similar conditions. Another DC servo motor is used to actuate the pair of pectoral fins to generate flapping motion, i.e., thrust generation as well pitching. The pectoral fins provide a sawtooth profile for gliding at a particular angle of attack and thrust generation during flapping.

3. Medium torque DC servo motor with compatible servo horns and cables and other auxiliaries (with position feedback)

A pitch-roll moving mass mechanism comprises a linear actuator and a DC servo motor to drive a mass along the longitudinal axis of the vehicle and rolls the same mass about the same axis. The mass used here is a dense metal deadweight. The pitch of the vehicle is achieved by moving the mass along the axis of the vehicle, whereas the roll of the vehicle is made by rolling the same mass for a particular pitch angle about the longitudinal axis.

4. Battery with suitable Charger for recharging

A rechargeable battery unit provides the power supply to all the electrical subsystems and an onboard microcontroller with data storage capability to control different modes of operation of the vehicle.

5. Microcontroller and Microprocessor

The program to control the vehicle is loaded in the microcontroller and microprocessor. These contain one or more CPUs (processor cores) along with memory and programmable input/output peripherals. The design shall be applicable for embedded applications and other general-purpose applications consisting of various discrete chips.

6. Motor driver module

The Motor Driver Module drives the DC Motors depending on the control signal from the microcontroller. It is a high-power motor driver perfect for driving DC Motors and Stepper Motors. It should have the onboard 3.3V and 5V logic level input supply to an external circuit. Bi-directional control of 1 brushed DC motor using single channel. It shall support motor voltage ranging from 5V to 30V. The driver should deliver maximum current up to 10A continuous and 30A peak for short initial bursts (around 10s). The motor driver shall have an NMOS H-Bridge circuit that can drive a current in either polarity and shall be controlled by Pulse Width Modulation (PWM). It shall support TTL PWM from microcontroller.

7. Limit switches

The limit switches shall limit the movement of the moving mass and the buoyancy module pistons actuated by the motors. Limit switches shall be RoHS compliant and have enough ruggedness to take push loads with ease of installation, and reliability of operation.

8. Attitude Heading Reference System (AHRS)

It measures the acceleration values of the vehicle and will be integrated over time to find the position and orientation. It is an electronic device that measures and reports a body's specific force, angular rate, and sometimes the orientation of the body, using a combination of accelerometers, gyroscopes, and sometimes magnetometers.

9. Underwater Position Ranging Module with auxiliaries and opensource software support

The underwater positioning system is a submersible Locator which consists a pinger mounted on the vehicle and a receiver module on the surface to track the vehicle location in real time. The system shall be capable to be interfaced on the opensource software (eg: QGroundControl) map display. It is capable of serial communication and have a facility of Application Programming Interface (API). The total system requires both a transmitter and a receiver with syncing clocks. Based on the transmitter sound pulse, the receiver uses time-of-flight to calculate slant range to the transmitter and phase measurements to determine the arrival angle of the sound pulse.

10. Cable Penetrators or connectors and Vent Plugs

Aluminium alloy based underwater cable penetrators or dry mateable connectors and vent plugsshall be rated up-to 30m depth. Proper sealing arrangement shall be made sure by these connectors for foolproof sealing for the sealing of external to internal connection (Example: Cables from a thruster or any external subsystem connected to the internal electronics.) The vent plugs shall require maintaining the vacuum in the internal chambers for proper sealing during operation.

11. Basic electronics and accessories for assembly with sufficient spares for operation

All types of electronics cableshall be made of high current rating Teflon & Rubber Silicone cables and accessories (including the internal and external cables). Other basic electronics kits, small battery for microcontroller/convertor (if necessary), connectors for interlinking and interfacing, Fuses and Holders, Terminal strips with lugs, Base plate for control board and IMU, etc., and all auxiliary circuits and boards shall be available for the complete assembly.

12. Fabrication, system integration and system acceptance procedure

All the mechanical systems should be fabricated as per the specifications and to be integrated and assembled as per the drawing. The pressure hull of the HPURV is made up of materials mentioned in the drawings. If the hull is made of GFRP (mold is required to be made available). It is rated to dive up to a depth of 30 m. The electrical components shall be interfaced with all other electrical components and integrated with the Mechanical systems. The mechanical hull and external finishing should be sound and integrity of the hull for sealing should be robust. The choice of sealing systems should be such that, the system does not leak under any circumstances until the rated depth. The total system subsystems and components are to be integrated along with sensors as per the drawing should be tested for its basic functionality. The total system consists of underwater vehicle, manipulator arm etc.

Important note

The temperature sensor, pressure sensor and an underwater thruster are not included in the procurement list and the same will be the scope of IIT Palakkad. New and able components will be provided to the vendor for assembly. The working condition of the components will be checked while handing over to the vendor and the same will tested again during the system delivery by the vendor to IITPKD in presence of both the parties. Any damage or malfunctioning of any of the components or its parts while returning to IIT Palakkad will lead to forfeiting of the equivalent costs including customs and other import charges from the final payment to be made to the vendor.

13. Sufficient spares of SS 316L fasteners (2 sets SS 316L fasteners)

SS 316L are austenitic stainless-steel types containing molybdenum as a constituent. These 316L fasteners are known for their general resistance properties, particularly pitting and crevice corrosion.

14. Assembly and Integration of Mechanical systems

All the subsystems must be integrated to make the prototype. All the subsystems are to be tested before the assembly. The vehicle should not have any leaks after the assembly.

15. Water Leak Test Evaluation

The hull shall be immersed in a water tank at a depth of 1-2 m for 48 hours and tested for any leaks. Ideally there should not be any variation from its dry weight after cleaning the water from the vehicle surface. However, the variation from its dry weight should not increase by 5% within the hull weight if GFRP is chosen as hull material. If it is just 5%, further test for another 48 hours would be done and the increase in weight should not exceed 6%.

16. Inspection and Operation Test Evaluation

Mechanical fabrication and assembly, procurement of electrical subsystems and integration of both actuators and sensor and other subsystems for basic operations and control are to be done both in air and water at the supplier site.

All the components shall conform to the design and dimensions indicated on the drawings. The basic functionality should be tested at the supplier's site before supply in the presence of IIT Palakkad representative.

The hull and accessories shall be inspected, tested, and certified by IIT Palakkad. The representative from IIT Palakkad shall have access at all reasonable times to all relevant phases of the work and shall be given reasonable notice in advance of the start of the manufacturing processes. The inspector shall have the opportunity to witness all assembly and testing.

No major modification on the drawing issued for fabrication is acceptable. However, in case of any minor modification required; not more than 10% of the total design specifications, they should be carried out during the course of fabrication. The same expenditure shall be borne by the supplier without any additional costs.

17. Surface Finish

The hull shall be fully externally finished and shall be painted with polyurethane primer and finish coat (in yellow). The top surface of the vehicle should be smooth and slippery. Other subcomponents shall be from any types of burs or notches.

18. Warranty

The item should be warranted for 12 months from the date of supply or acceptance of materials by IIT Palakkad.

19. Delivery Schedule

The total interfaced system along with all other accessories should be supplied within 24 weeks from the date of purchase order.

20. Pre-qualification criteria

The bidders who are bidding for this tender shall have implemented at least one (supply, integration, and installation of the marine or equivalent mechanical products) ocean/marine related project or similar orders of Hybrid Propulsion Underwater Robotic Vehicle for Ocean Observationsduring previous or current financial year to any of the reputed firms/Institutions, preferably to centrally funded technical institutes (CFTI) institutes or Research institutes in India. Copies of the most recent purchase orders and certificates of successful implementation must be included.

Item	Technical specification description	Qty	Compliance
High torque DC motor with optical encoder with PID motor drive	Type: 12V DC Motor with Gearbox Speed: >120RPM Encoder Type: Optical/Magnetic Encoder Resolution: 768CPR of Output Shaft Diameter: <30mm Length: <42mm Total Length: <85mm Diameter of Shaft: 6mm Stall Torque: > 50 kgf-cm	5	
High torque DC servo motor with compatible servo horns and cables and other auxiliaries	Type: 6-12V DC servo Motor Speed: > 60 rpm Height: < 44mm width: < 62mm Length: < 41mm Feedback functions: Readable Position Feedback Resolution: < 1.00° Position sensor: Contactless Absolute Encoder Command signal: Digital Data Packet Stall Torque: > 60 kgf-cm	5	

Medium torque DC servo motor with compatible servo horns and cables and other auxiliaries	Type: 6-12V DC servo Motor Speed: > 58 rpm Height: < 40mm width: < 50mm Length: < 32mm Gear ratio: >254:1 Resolution: 0.29° Protocol: TTL Half-duplex (asynchronous serial comm.) Link(physical): TTL /RS485 Multi drop Baud rate: approximately 1Mbps Feedback functions: Readable Position Feedback Position sensor: Contactless absolute encoder Command signal: Digital packet Stall Torque: minimum 15 kgf-cm	2	
2 Battery with 1suitable Charger for recharging	Voltage: 11.1 V Type: Li-Po/Li-Ion Capacity: 5000-10000 mAh Discharge: 20 C - 30 C	2	
	Charger: Type: Li-Po/Li-Ion 10A Charge capacity, Balance charging, Fast charging	1	

Controller and Micro-processor	ATmega328P – 8 bit AVR family microcontroller, Operating Voltage: 5V, Recommended Input Voltage: 7-12V, Input Voltage Limits : 6-20V, Analog Input Pins: 12, Digital I/O Pins: 20 (Out of which 10-12 provide PWM output), DC Current on I/O Pins: 20-40 mA, DC Current on 3.3V Pin: 20-50 mA, Flash Memory: 32 KB (0.5 KB is used for Bootloader), SRAM: 2 KB, EEPROM: 1 KB, Frequency (Clock Speed): 16 MHz LPDDR4 2GB variant with all power and communication auxiliaries Broadcom BCM2711, quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz Other requirements 32-bit ARM Cortex M4 core with FPU 168 Mhz/256 KB RAM/2 MB Flash 32-bit failsafe co-processor Inbuilt MPU6000 as main accel and gyro ST Micro 16-bit gyroscope ST Micro 14-bit accelerometer/ compass (magnetometer) MEAS barometer Ideal diode controller with automatic failover Servo rail high-power (7 V) and high-current ready All peripheral outputs over-current protected, all inputs ESD protected Interfaces: 5x UART serial ports, 1 high-power capable, 2 with HW flow control Spektrum DSM/DSM2/DSM-X Satellite input Futaba S.BUS input (output not yet implemented) PPM sum signal RSSI (PWM or voltage) input I2C, SPI, 2x CAN, USB 3.3V and 6.6V ADC inputs	1 set	
Compatible Motor drivers to power the High torque DC motor (Motor driver module with PWM control with maximum current upto 30A)	Operating Voltage (VDC) – 5V to 24V range with protection mode Peak current capability: 30A (short bursts) Continuous maximum current: 10A Operating Modes: Lock-Antiphase Mode and Sign-Magnitude Mode Number of motor channels: minimum 01 with manual button for polarity reverse Power-On LED indicator	5	

Limit switches	(Rating: DC: 0.3A, up to 250V DC Contact configuration: SPDT Switch Size: 2.8*1*1.6cm (L*W*H maximum) Terminal Blade Width: 0.47 cm)	10	
Attitude Heading Reference System	Power Supply - +4 to +10V DC 3.3V Logic UART Interface Input Power, Operating Mode (Typical @ 4V) 60 mW Input Power, Sleep Mode (Typical @ 4v)- 16 mW Static Heading Accuracy -0.2° RMS maximum Dynamic Heading Accuracy - 1.0° RMS Static Pitch/Roll Accuracy - 0.2° RMS Dynamic Pitch/Roll Accuracy - 1.0° RMS Accelerometer Range - ± 4g Pitch/Roll Range - ± 90°, ± 180° Accel Bias Stability - 0.07441 mg Accel Noise Density - 250 ug/√Hz Accel Velocity Random Walk (VRW) -0.09123 (m/s)/√Hr Gyro Angular Random Walk (ARW)-0.2546°/√Hr Gyro Dynamic Range- ± 500°/sec (± 300°/sec) Gyro Bias Stability- 6.415°/Hr Gyro Noise Density -0.04 dps/√Hz Magnetic Range-±1.2 Gauss Update Rate (Samples/Sec)-10, 100 Baud Rate- 1.2, 2.4, 4.8, 9.6; 19.2; 38.4; 57.6; 115.2 kbaud L x W x H - 40 x 25 x 10 mm approximately Temperature Compensated Resistance to environment- Humidity 95%, 70° C, 24 hrs, as per MIL-STD-202G – Method 103A, Test Condition A Shock Resistance-5000g, 1ms Pulse, Half-Sine Wave Vibration Resistance-.02 dB Power Spectral Density, 5.35 G RMS, Meets MIL-STD-202G – Method 214A, Test Condition I/C 3D & In-Field Calibration and shall maintain function (functionality)when inverted Quaternion/Rotation Matrix Output True North Heading Output Includes World Magnetic Model RoHS Compliant Maximum Magnetic Inclination (Dip) ± 80° User Programmable Customizations Encapsulation or Enclosure shall be provided	1	

Underwater Position Ranging Module with auxiliaries and opensource software support (should be typically a plug and play system)	Depth: Minimum 30m Net Buoyancy of the receiver and transmitter units in water: Neutrally buoyant Absolute Maximum Range of operation: Minimum 1 km Usable Range: minimum 3m to 300m Apparent Yaw/Azimuth resolution: 1° Apparent Elevation angle resolution: 1° Slant range measurement resolution: minimum 0.1m Slant range error accumulation: should not be more than 2 m/hr IMU Euler angle accuracy: ≤ 2° Update rate: 1Hz Ping Frequency range: 25 kHz Operational voltage: 6-12V DC Total power consumption: < 1Watt Atleast one on-board IMU is present **Data Communication with Serial Parameters** Both transmitter and receiver should support TTL-level communication at 115,200 baud, 8 bits, no parity, one stop bit. Serial to USB conversion (Logging to USB drive)	1set	
Cable Penetrators or connectors	Modular underwater cable penetrators/connectors rated up-to 30m depth for sealing all the external cables	5	
Vent Plugs	Aluminium alloy based underwater plugs rated up-to 30m depth	5	
Basic electronics and accessories for assembly with sufficient spares for operation	Electronics Cable and Accessories (including the internal and external cables (Teflon & Rubber Silicone cables), Battery for microcontroller/convertor, connectors for interlinking and interfacing, Fuses and Holders, Terminal strips with lugs, Base plate for control board and IMU, etc., and all auxiliary circuits and boards for complete assembly	1set	
Fabrication of Hull along with sub systems and supply SS316L Fasteners	As per the drawings attached	1	
1 set spares of SS 316L fasteners, O-rings and other auxiliaries apart from the set fixed on the vehicle	Additional set of spares	1set	
Assembly and Integration of Mechanical systems	Mechanical hull with subsystems assembly and integration of electrical components	1	
Water Leak and Operation Test Evaluation	Valid leak proof test at 1m depth and testing of the complete vehicle assembly	1	

ANNEXURE-II

FORMAT FOR SELF-CERTIFICATION UNDER PREFERENCE TO MAKE IN INDIA
(TO BE SUBMITTED ONLY THROUGH ONLINE MODE IN APPROPRIATE FORMAT)

Format for Affidavit of Self-Certification regarding Minimum Local Content in line with "Make in India" Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019 and 04.06.2020)

Date: _____
I/We _____ S/o, D/o, W/o, _____
Resident of
_____
Hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Order, 2017 (hereinafter PPP-MII order) of Government of India issued vide Notification No:P-45021/2/2017 -BE-II dated 15/06/2017, its revision dated 28/05/2018 and any subsequent modifications/Amendments, if any and

That the local content for all inputs which constitute the said goods/services/works has been verified by me and I am responsible for the correctness of the claims made therein.

Tick (✓) and Fill theAppropriate Category	
☐	I/We _____ [name of the manufacturer] hereby confirm in respect of quoted items(s) that Local Content is equal to or more than 50% and come under **"Class-I Local Supplier"** category.
☐	I/We _____ [name of the manufacturer] hereby confirm in respect of quoted items(s) that Local Content is more than 20% but less than 50% and come under **"Class-II Local Supplier"** category.
☐	I/We _____[name of the manufacturer] hereby confirm in respect of quoted items(s) that Local Content is less than or equal to 20% come under "**Non-Local Supplier"** category.

For and on behalf of…… (Name of firm/entity)

Authorized signatory (To be duly authorized by the Board of Directors)
<Insert Name, Designation and Contact No.>

[Note: In case of procurement for a value in excess of Rs. 10 Crores, the bidders shall provide this certificate from statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.]

ANNEXURE-III

BID SECURITY DECLARATION FORM
(TO BE SUBMITTED ONLY THROUGH ONLINE MODE IN APPROPRIATE FORMAT)

Date:_____ Tender No. _____

To (insert complete name and address of the purchase)

I/We. The undersigned, declare that:

I/We understand that, according to your conditions, bids must be supported by a Bid Securing Declaration.

I/We accept that We may be disqualified from bidding for any contract with you for a period of one year from the date of notification if l am /We are in a breach of any obligation under the bid conditions, because I/We

a) Have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or
b) Having been notified of the acceptance of our Bid by the purchaser during the period of bid validity (i) fail or reuse to execute the contract, if required, or (ii) fail or refuse to furnish the Performance Security, in accordance with the Instructions to Bidders.

I/We understand this Bid Securing Declaration shall cease to be valid if I am/we are not the successful Bidder, upon the earlier of (i) the receipt of your notification of the name of the successful Bidder; or (ii) thirty days after the expiration of the validity of my/our Bid.

Signed: (insert signature of person whose name and capacity are shown)
in the capacity of (insert legal capacity of person signing the Bid Securing Declaration)

Name: (insert complete name of person signing he Bid Securing Declaration)

Duly authorized to sign the bid for an on behalf of (insert complete name of Bidder)

Dated on _____ day of _____(insert date of signing)

Corporate Seal (where appropriate)

(Note: In case of a Joint Venture, the Bid Securing Declaration must be in the name of all partners to the Joint Venture that submits the bid)

Note:

This letter should be on the letterhead of the quoting firm and should be signed by a Competent Authority. Non-submission of this will lead to DISQUALIFICATION of bids.

ANNEXURE-IV

UNDERTAKING BY THE BIDDER
(TO BE SUBMITTED ONLY THROUGH ONLINE MODE IN APPROPRIATE FORMAT)

We here by accept all the Terms and Conditions of the Tender Document and strictly adhere to the same in the event of getting Purchase order. We also declare that the Technical and Financial Bids submitted by us has NO DEIVATION from the Tender Terms and Conditions.

We here by accept that the PRICES OF THE EQUIPMENT/ITEMS QUOTED IS IN INDIAN RUPEES ONLY (INR). I am aware that if the price is not in INR, the application shall be summarily rejected.

We hereby accept and certify that the **Unit Price quoted in the Commercial Bid / BoQ Commercial, covers the entire STANDARD WARRANTY period indicated in the BoQ Commercial**. No Additional Prices shall be quoted for the **STANDARD WARRANTY period.** I am aware that the Bid shall be rejected outright in case of non-compliance with the above.

We hereby undertake that there are _____ pages, serially numbered, in the submitted tender including the supporting documents. (Please serially number all the pages including blank page, if any).

Note:
This letter should be on the letterhead of the quoting firm and should be signed by a Competent Authority.

ANNEXURE-V

FALL CLAUSE NOTICE CERTIFICATE
(TO BE SUBMITTED ONLY THROUGH ONLINE MODE IN APPROPRIATE FORMAT)

This is to certify that we have offered the maximum possible discount to you in our Quotation No. _____ dated _____ **(Please do not reveal the prices here, which will lead to outright rejection of your bid).**

The prices charged for the Stores supplied under tender should under no event be higher than the lowest prices at which the party sells the items of identical description to any other Govt. organization/PSU's/Central Govt, /State Govt. Autonomous bodies/Central/state Universities/Central/State Educational Institutions, failing which the "**FALL CLAUSE**" will be applicable. The institute will look into a reasonable past period to ensure this.

In case, if the price charged by our firm is found to be more, **IIT Palakkad** will have the right to recover the excess charged amount from the subsequent/unpaid bill of the supplier.

Note:
This letter of authority should be on the letterhead of the quoting firm and should be signed by a Competent Authority and having the power of attorney.