INVITATION FOR QUOTATION

TEQIP-III/2018/ntst/Shopping/34 **28-Dec-2018**

To,

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Sub: Invitation for Quotations for supply of Goods

Dear Sir,

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

Sr. No	**Brief Description**	**Quantity**	**Delivery Period(In days)**	**Place of Delivery**	**Installation Requirement (if any)**
1	Components for Heat Engine and Thermal Laboratory.	1	30	National Institute of Technology, Sikkim: ravangla-737139, South Sikkim, Sikkim, India	Mandatory

2. Government of India has received a credit from the International Development Association (IDA) towards the cost of the **Technical Education Quality Improvement Programme[TEQIP]-Phase III** Project and intends to apply part of the proceeds of this credit to eligible payments under the contract for which this invitation for quotations is issued.
3. Quotation,

   3.1 The contract shall be for the full quantity as described above.

3.2 Corrections, if any, shall be made by crossing out, initialing, dating and re writing.

3.3 All duties and other levies payable by the supplier under the contract shall be included in the unit price.

3.4 Applicable taxes shall be quoted separately for all items.

3.5 The prices quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.

3.6 The Prices should be quoted in Indian Rupees only.

4. Each bidder shall submit only one quotation.
5. Quotation shall remain valid for a period not less than **45** days after the last date of quotation submission.
6. Evaluation of Quotations,

   The Purchaser will evaluate and compare the quotations determined to be substantially responsive i.e. which

   6.1 are properly signed ; and

   6.2 confirm to the terms and conditions, and specifications.
7. The Quotations would be evaluated for all items together.
8. Award of contract:

   The Purchaser will award the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.

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

   8.2 The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be incorporated in the purchase order.
9. Payment shall be made in Indian Rupees as follows:

   Delivery and Installation - 80% of total cost

   Satisfactory Acceptance - 20% of total cost

10. All supplied items are under warranty of **24** months from the date of successful acceptance of items.
11. You are requested to provide your offer latest by **17:00** hours on **31-Jan-2019 .**
12. Detailed specifications of the items are at Annexure I.
13. Training Clause (if any) **Yes required**
14. Testing/Installation Clause (if any) **Yes required**
15. Information brochures/ Product catalogue, if any must be accompanied with the quotation clearly indicating the model quoted for.
16. Sealed quotation to be submitted/ delivered at the address mentioned below,

    NIT Sikkim, Barfung Block, Ravangla, South Sikkim Pin Code-737139
17. We look forward to receiving your quotation and thank you for your interest in this project.
18. You are requested to submit, necessary documents/work orders in support of the delivery of Heat Engine lab equipments to NITs/ IITs.
19. DSIR certificates will be provided, if required.
20. Quality of equipment and accessories should be the responsibility of the supplier.
21. Institute committee constituted for this purpose has the full right to replace the items which do not adhere the quality parameters.
22. The supplier has to submit performance security deposit. It will be returned after the satisfactory performance of the individual equipment.

(Authorized Signatory)

Name & Designation

Nodal Officer (Procurement)
TEQIP-III
National Institute of Technology Sikkim

Annexure I

Sr. No	Item Name	Specifications
1	Components for Heat Engine and Thermal Laboratory.	**1. Cut section model of actual single cylinder four stroke diesel engine for plotting valve timing diagram** **(Quantity: 1)** **Description** The engine will be sectioned to show the internal constructional details. The working of individual part and accessories like valves, pistons, pumps, crank and camshaft, etc. will be demonstrated. It is provided with Flywheel and it is mounted on a sturdy iron frame. This actual cut section engine helps the student to understand about the parts and the working of the engine very easily. It is specially made dissectible for demonstration purposes. The actual cut section engine will be supplied with key card & very interesting literature regarding working. The engine is driven through electric drive unit at 20-30 RPM. All arrangements will be made so that valve timing diagram can be plotted. **2. Cut section Model of Actual Single Cylinder Two Stroke Petrol Engine for Plotting Port Timing Diagram** **(Quantity: 1)** **Description** The engine will be sectioned to show the internal constructional details. The working of individual part and accessories like Ports, pistons, pumps, crank and camshaft, etc. will be demonstrated. It is provided with Flywheel and it is mounted on a sturdy iron frame. This actual cut section engine helps the student to understand about the parts and the working of the engine very easily. It is specially made dissectible for demonstration purposes. The actual cut section engine will be supplied with key card & very interesting literature regarding working. The engine is driven through electric drive unit at 20-30 RPM. All arrangements will be made so that port timing diagram can be plotted. **3. Cut section model of actual single cylinder four stroke petrol engine for plotting valve timing diagram** **(Quantity: 1)** **Description** The engine will be sectioned to show the internal constructional details. The working of individual part and accessories like valves, pistons, pumps, crank and camshaft, etc. will be demonstrated. It is provided with Flywheel and it

		is mounted on a sturdy iron frame. This actual cut section engine helps the student to understand about the parts and the working of the engine very easily. It is specially made dissectible for demonstration purposes. The actual cut section engine will be supplied with key card & very interesting literature regarding working. The engine is driven through electric drive unit at 20-30 RPM. All arrangements will be made so that valve timing diagram can be plotted. **4. Cut section model of four stroke four-cylinder diesel engine** **(Quantity: 1)** **Description** The engine will be sectioned to show the internal constructional details. The working of individual part and accessories like valves, pistons, pumps, crank and camshaft, etc. will be demonstrated. It is provided with Flywheel and it is mounted on a sturdy iron frame. This actual cut section engine helps the student to understand about the parts and the working of the engine very easily. It is specially made dissectible for demonstration purposes. The actual cut section engine will be supplied with key card & very interesting literature regarding working. The engine is driven through electric drive unit at 20-30 RPM. All arrangements will be made so that valve timing diagram can be plotted. **5. Assembling and dismantling of a four stroke four-cylinder petrol engine** **(Quantity: 1)** **Description** Engine setup will be prepared by using good working condition petrol engine with all the fittings of the engine along with air filter, starter, battery, alternator, indication meters, fuel tank, electrical wiring. All mounted on to a sturdy iron frame with caster wheels (mobile trolley). All the fittings such as meter, fuel tank, radiator along with the engine will be arrange on to the trolley with its original fittings. With the help of this engine the students can practice assembly & disassembly under the supervision of their teacher. The engine is provided with swirling stand & the same can be mounted on the swirling stand for assembling and dismantling. Tools required for assembly & disassembly can also be provided but at an extra cost **6. Single Cylinder Four Stroke Petrol Engine Test Rig** **(Quantity: 1)** **Description** The setup consists of single cylinder, four stroke, petrol engine

		connected to Eddy current dynamometer for engine loading. The setup has stand-alone type independent panel box consisting of air box, fuel tank, manometer, fuel measuring unit, digital speed indicator and digital temperature indicator. The setup enables study of engine for brake power, BMEP, brake thermal efficiency, volumetric efficiency, specific fuel consumption, air fuel ratio and heat balance. Provision is also made for calculating Frictional power . Set up is supplied with MS Excel program for Engine Performance Analysis. Specification: Engine: Make -Honda, Model -Honda GX200D QX, Type-Single cylinder, 4 stroke Petrol, Air cooled, 4.1 KW at 3600 rpm, stroke 54 mm, bore 68 mm. Capacity 196 cc Dynamometer: Type eddy current, water cooled Propeller shaft: With universal joints Air box: M S fabricated with orifice meter and manometer Fuel tank: Capacity 15 lit with glass fuel metering column RPM indicator: Digital with non contact type speed sensor Temperature sensor: Type Thermocouple, Type K Temperature indicator: Digital, Range 0-1200 Deg C Load indicator: Digital, Range 0-50 Kg, Supply 230VAC Load sensor: Load cell, type strain gauge, range 0-50 Kg **7. Four stroke single cylinder diesel engine test rig** **(Quantity: 1)** **Description** The setup consists of single cylinder, four stroke, Diesel engine connected to Eddy current for engine loading. The setup has stand-alone type independent panel box consisting of air box, fuel tank, manometer, fuel measuring unit, digital speed indicator and digital temperature indicator. Engine jacket cooling water inlet, outlet and calorimeter temperature is displayed on temperature indicator. Rotameters are provided for cooling water and calorimeter flow measurement. The setup enables study of engine for brake power, BMEP, brake thermal efficiency, volumetric efficiency, specific fuel consumption, air fuel ratio and heat balance. It is supplied with MS Excel program for Engine Performance Analysis. Specification: Engine: Make Kirloskar, Model TV1, Type Single cylinder, 4 stroke Diesel, water cooled, power 5.2 kW (7 BHP) at 1500 rpm, stroke 110 mm, bore 87.5 mm. compression ratio 17.5:1, capacity 661 cc. Dynamometer: Type rope break dynamometer/ hydraulic dynamometer Propeller shaft: With universal joints Air box: M S fabricated with orifice meter and manometer Fuel tank: Capacity 15 lit with glass fuel metering column Calorimeter: Type Pipe in pipe Temperature sensor: Thermocouple, Type K Temperature indicator: Digital, multi channel with selector switch

		Speed indicator: Digital with non contact type speed sensor Load sensor: Load cell, type strain gauge, range 0-50 Kg Load indicator: Digital, Range 0-50 Kg, Supply 230VAC Rotameter: Engine cooling 40-400 LPH; Calorimeter 10-100 LPH Pump: Type Monoblock **8. ROTARY AIR COMPRESSOR (RADIAL COMPRESSOR)** **(Quantity: 1)** **Description** Unit features a two-stage radial compressor with variable speed via a frequency converter, an intake pipe and a delivery pipe. The intake and delivery pipes are transparent. A protective plate placed in front of the inlet of the intake pipe prevents larger objects from being drawn in or the clogging of the intake opening. The air flow is adjusted by a throttle valve at the end of the delivery pipe. The experimental unit is fitted with sensors for pressure, temperature and speed. The flow rate is determinate via differential pressure measurement on the intake nozzle. Measuring ranges differential pressure (stage 1 / stage 2): 0…350mbar flow rate: 0…120m^3/h temperature: 2x 0…100°C electrical power consumption: 0…1000W Mass flow rate according to medium capacity. Experimentation • operating behavior and characteristic variables of a radial compressor • recording of the compressor curve for both stages • effect of the rotor speed on the pressure • effect of the rotor speed on the flow rate • distribution of stage pressure ratios • effect of compression on the temperature increase • determination of hydraulically power output and efficiencies **9. Centrifugal blower test rig (Variable Speed)** **(Quantity: 1)** **Description** The apparatus consists of a spiral casing, which houses an impeller. Impeller is driven by a variable speed D.C. motor. Three, interchangeable impellers, viz. Radial forward and Backward curved vanes are provided with the unit. Digital indicators are provided for speed of impeller. A venture provided measures the discharge. Thus students can evaluate the

		performance of different impellers at various speeds. SPECIFICATIONS: 1. Blower - Spiral casing with three interchangeable impellers viz. forward, backward and radial vanes. 2. Drive Motor-1 HP DC motor, 3000 RPM with Dimmer control to vary the speed from 300 to 3000 RPM. 3. Digital Speed indicator for speed measurement. 4. Ventura with water manometer to measure air flow. 5. Water manometer to measure discharge pressure. 6. Discharge pipe with flow control valve. A technical manual accompanies the unit. SERVICES REQUIRED: 1. Floor space of about 2m X 1.5m X 1.5m height. 230 V. 5A., 50 Hz, AC Supply. **10. Centrifugal blower test rig (variable speed) with data logging facility** **(Quantity: 1)** **Description** This equipment comprises of a FD Centrifugal Blower coupled to a Motor. Three interchangeable impellers with forward, backward and radial vanes are provided with the test rig. A Pitot Tube is provided in the delivery line of blower for static & dynamic pressure. Technical details Drive : AC motor, 1HP Crompton. Blower : Centrifugal, Forced Draft Type Impeller (3 Nos.) : Forward Curved, Backward Curved & Radial Curved Pitot Tube (with manometer): For Static, Dynamic & Differential Pressure measurement. Stop watch : Electronic Control Panel Comprises of: Energy measurement : Electronic Energy meter MCB : For Over load Protection. Experimentation • To study the effect of forward curved, back curved and radial curved impeller • To find out the discharge, head and efficiency of the Centrifugal Blower. • To plot the graph Efficiency vs Discharge • To plot the graph Discharge vs Head **11. Bomb Calorimeter** **(Quantity: 1)** **Description** Microcontroller based which makes the unit accurate and highly stable for measurement of temperature to calculate the calorific value experiments in

		bomb calorimeter. JUMBO size 16 x 2 characters LCD display with backlight. Timer control through RTC(Real Time Clock) which makes it highly accurate. Thermal printer for printing the final result. Thermal printer Printout Report Format for SAMPLE TEST • COMPANY NAME and LOGO • TYPE OF TEST :- SAMPLE TEST • MAX.TEMPERATURE RISE • MASS OF TABLET • WATER EQUIVALENT • FINAL CALCULATED CALORIFIC VALUE • DATE & TIME OF TEST Thermal printer Printout Report Format for Water Equivalent Test • COMPANY NAME • TYPE OF TEST :- WATER EQUIVALENT TEST • MAX.TEMPERATURE RISE • MASS OF TABLET • BENZOIC ACID CALORIFIC VALUE • FINAL CALCULATED WATER EQUIVALENT • DATE & TIME OF TEST 16 soft-touch Keypad for Menu driven settings of different parameters. Automatic detection of temperature rise& fall. Automatic measurement and mathematical calculation of the calorific value/Water Equivalent; which eliminates the requirement of operator to be continuously present to note the maximum temperature rise &to do the calculations manually. Weight of tablet settable through keypad by user. Water equivalent settable through keypad by user. Automatic calculation for Sample Test or Water Equivalent Test from maximum temperature rise value. Full test report printout with date and time& company name. Temperature scanning resolution of 0.01 degree Celsius. Resolution: 0.01 kcal/gm or better Pressure Calibration at 300 Psig Automatic alarm on Firing as well as after the test completes. Sensor open detection. Fuse wire open detection through message on LCD. No paper or printer door open detection. User friendly system handling messages on LCD Type of test selectable Memory storage for data. Fuse Wire & Cotton error adjustable. RS232 interface with data logging on PC **12. Four Stroke One Cylinder, Multi fuel, with Open ECU for Petrol mode** **(Quantity: 1)**

		Description Engine : Kirloskar make Single cylinder, 4 stroke, water cooled, stroke 110 mm, bore 87.5 mm, 661 cc. Diesel mode: 3.5 KW, 1500 rpm, CR range 12-18. Injection variation:0- 25^0 BTDC Petrol mode: 3.5 KW@ 1500 rpm, Speed range 1200-1800 rpm, CR range 6-10, Dynamometer : Type eddy current, water cooled with loading unit Propeller shaft: With universal joints Air box: M S fabricated with orifice meter and manometer Fuel tank: Capacity 15 lit with glass fuel metering column Calorimeter: Type Pipe in pipe ECU: PE3 Series ECU, full build, potted enclosure with peMonitor & peViewer software. Piezo sensor: Combustion: Range 350Bar, Diesel line: Range 350 Bar, with low noise cable Crank angle sensor: Resolution 1 Deg, Speed 5500 RPM with TDC pulse. Data acquisition device: NI USB-6210, 16-bit, 250kS/s. Temperature sensor: Type RTD, PT100 and Thermocouple, Type K Temperature Transmitter:Type two wire, Input RTD / Thermocouple, Output 4–20 mA Load sensor: Load cell, type strain gauge, range 0-50 Kg Fuel flow transmitter: DP transmitter, Range 0-500 mm WC Air flow transmitter: Pressure transmitter, Range (-) 250 mm WC Software: "Enginesoft" Engine performance analysis software Rotameter: Engine cooling 40-400 LPH; Calorimeter 25-250 LPH Pump: Type Monoblock **13. Cut section Model of Lancashire Boiler** **(Quantity: 1)** **Description** Steel Shell is of about 75 cm long and 20 cm in diameter. Two large tubes known as fire tubes pass from end to end. At the front end from each tube a furnace fire grating is placed and a door is hinged. Brick work, seating and flues are shown in wood work. The boiler is complete with dead weight safety valve, manhole, mud hole, check valve high steam and low water safety valve, steam and water gauges, regulating draught doors, dampers with counter weights and chimney. The model is approximately one meter in length, 37 cm in breadth and 45 cm high. It is specially made dissectible for demonstration purposes. **14. Cut section Model of Babcock & Wilcox Boiler** **(Quantity: 1)**

		Description It is a water tube boiler. The shell is 15 cm in diameter and 75 cm in length and is fitted with a super heater and with inclined water tubes over the furnace connected with headers. The model is fitted with stop valve, safety valve, water gauge, steam gauge, man hole, mud hole, regulating draught door, damper with counter weight and chimney. Seating and brick work are shown in wood work. The model is approximately one meter in length 28 cm in breadth and 77 cm high. **15. Cut section Model of Cochran Boiler** **(Quantity: 1)** **Description** The model is the best known vertical type fire tube boiler. The shell is about 25 cm. in diameter and 60 cm, high. The cylindrical fire box is with a door and grate at its bottom. Hot gasses pass from the fuel to the combustion chamber through a short flue pipe and then to chimney through the tubes. At both ends of the tubes covers are given and tubes can be cleaned after their removal. The model is complete with feed check valve, steam and water gauges, stop valve, safety valve and manhole. **16. Cut section Model of Bent Tube Boiler/ Stirling Boiler** **(Quantity: 1)** **Description** It comprises two upper drum, Mud drum, Water Tubes, Baffle wall, super heater, Steam Pipe and stop valve etc. Made of wooden and metal parts. Size about 50 x 20 x 75 cm. **17. Able Flash Point Apparatus** **(Quantity: 1)** **Description** This Apparatus is suitable for determining the close cup flash point of petroleum and mixtures according to IP 33 and IP 170 and also IS 1448 (Part I) 1985 (P:20). It is suitable for oils whose flasher below 70 C. It is supplied with oil cup; cover Fitted with Stirrer, Thermometer Socket S.S. Water Bath, Stand An Electric Heater is Fitted at bottom for operation on 220 volts AC Circuits **18. Pensky Marten Flash Point Apparatus** **(Quantity: 1)** **Description** This Apparatus is made as per IP 34, ASTMD-93 and IS 1448 (Part I) 1270 (P.21) and IS 1209-1953 Method B. Used for finding out flash point above

		70 c And below 300 C. The instrument having oil test jet/gas test jet flame device, stirrer with flexible shaft. The assembly rests in air bath which is covered with dome shape metal top. The cup is fitted with insulated handle and locking arrangement near cup flange. The assemble is kept on round shape electric heater with separate temp. Regulator. Suitable for operation on 220 Volts 50 cycles AC Circuits **19. Cleveland Flash point & Fire Point Apparatus** **(Quantity: 1)** **Description** This Apparatus is used for determination of flash point and fire point of petroleum products open cup flash above 80 C as per specification IP 36 and IS:1448 (P:69) 1969. The apparatus consists of a brass cup, heating plate to specific dimension thermometer clip and test flame attachment with swivel joint for passing over test Liquid surface in the prescribed manner, heating is controlled by means of energy regulator fitted to the apparatus. Suitable for aperation on 220 volts 50 cycles AC Circuits **20. Thermal Imager** **(Quantity: 1)** **Description** Detector Type: Uncooled micro bolometer Detector IR Resolution: 80 × 60 pixels or more Spectral range: 7.5–14 µm Thermal Sensitivity/ NETD: < 0.10°C or better Field of view: 41° × 31° Minimum focus distance (Thermal): 0.15 m Focal length: 1.54 mm Spatial resolution (IFOV): 11 mrad Image frequency: 9 Hz Object temperature range: -10^{o}C to +150^{o}C Accuracy: ±2^{o}C Display: 3.0 inch, 320 × 240 pixels color capacitive touch display Image Auto orientation: Yes, Should be available Color palettes: Iron, Rainbow, Rainbow HC, Gray Emissivity correction: Yes; matt/semi-matt/semi-glossy, custom value Spotmeter: On/off Area: Box with max/min Image Presentation: Infrared image and Visual Image Infrared Image Should Add visual details to full resolution thermal image Picture in Picture: IR area on visual image Storage media: Internal memory store at least 500 sets of images

		Image file format: Standard JPEG, 14-bit measurement data included Non-radiometric IR video streaming: Should be available Visual video streaming: Should be available Built in Digital camera: 640 × 480 pixels Digital camera, focus: Fixed focus Data communication interfaces: Wi-Fi, USB standard: USB 2.0 Battery type: Rechargeable Li-ion polymer battery Charging system: Should Charged inside the camera Battery operating time: 2 hours Automatic shut-down: Yes, Should be available Operating temperature range: –10°C to +50°C Camera housing and lens Encapsulation: IP 40 (IEC 60529) Vibration: 2 g (IEC 60068-2-6) Drop: 2 m (6.6 ft.)

FORMAT FOR QUOTATION SUBMISSION

(In letterhead of the supplier with seal)

Date: _____

To:

_____

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

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

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

We confirm that the normal commercial warranty/ guarantee of ——————— months shall apply to the offered items and we also confirm to agree with terms and conditions as mentioned in the Invitation Letter.

We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery.

Signature of Supplier

Name: _____

Address: _____

Contact No: _____