

**TENDER FOR**

**Single cylinder four stroke VCR Diesel Engine testrig**

**TO**

**MECHANICAL ENGINEERING DEPARTMENT**

**DR.BABASAHEB AMBEDKAR TECHNOLOGICAL  
UNIVERSITY, LONERE-402 103.  
TAL. MANGAON, DIST. RAIGAD. M. S.**

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DR.BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,  
Lonere – 402 103., Tal. Mangaon, Dist. Raigad.

**: TENDER NOTICE : DBATU/03/2011, DATE:- 15<sup>th</sup> September 2011**

Sealed Tenders in B-1 Form are invited by the under signed from the OEM Parties or authorized dealers for the supply of below mentioned product under UGC/University grants.

Name of Equipment	E.M.D. in Rs.	Cost of Blank Tender	Validity
<b>Single cylinder four stroke VCR Diesel Engine test rig</b>	5,000/-	500/-	6 Months

Blank Tender forms will be issued in this office from **19/09/2011 TO 17/10/2011** during **10.00 a.m. to 01.00 p.m.** on working days in cash only. Alternatively the form can also be downloaded from our website. However a D.D. drawn in favor of 'The Registrar, Dr. Babasaheb Ambedkar Technological University, Lonere. Dist Raigad. Maharashtra.' Payable at Mangaon is to be attached along with the tender document in envelope I.

Last date of receipt of completed tender forms is **18/10/2011 up to 3.00p.m.** The schedule for opening the tenders will be notified on university's website in due course of time. Right to reject any or all tenders without assigning any reason thereof is reserved by the competent authority.

REGISTRAR

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,  
LONERE, 402 103, TAL. MANGAON, DIST. RAIGAD.**

*: Tender Notice and Tender Conditions :*

1. Sealed tender in duplicate will be received on prescribed form by the purchasing officer in his office up to the dates mentioned for the supply of stores as per schedules attached.
2. Prescribed Tender Form will be available from this office on payment of **Rs.500/-** non-refundable; on any working day between **10.00 a.m. and 1.00 p.m.** alternatively the form can also be downloaded from our website. However a D.D. drawn in favor of 'The Registrar, Dr. Babasaheb Ambedkar Technological University, Lonere. Dist Raigad. Maharashtra.' Payable at Mangaon is to be attached along with the tender document in envelope I.
  - a) Tenders should quote rates for F.O.R., destination and submit the original tender in printed Tender Form and duplicate copy of an ordinary typed form along with a covering letter attached therewith. They should state the earliest delivery period necessary for completion of the order.
3. The origin of stores offered whether Indian or foreign and in the case of the former, state in which it is manufactured should be clearly stated against each article.
4. The tender in duplicate should be submitted in sealed cover and super scribed with tender No. and date of opening of the tender. The right to ignore any tender which fails to comply with the above instructions is reserved. All outstation tenders should be sent by Registered Post.
5. **Opening of tender** – You are at liberty to be present or authorize your representative to be present at the opening of tender at the time and date specified in the schedule.
6. (a) In the case of stores, subject to price fluctuation clause, the details, viz., i) manufacturer's price ex-works or ex-point of dispatch whether on Rail or sea, ii) freight, iii) dues, and iv) other charges including firm's margin should be clearly and separately stated.
  - (b) Basis of revision in price, if claimed, should be accompanied by details of variation in no other case any revision of price admissible.

7. The purchasing officer does not pledge himself to accept the lowest or any tender and reserves to himself the right of accepting the whole or any part of the tender or portion of the quantity offered against any item and you shall supply the same at the rate quoted. You are at liberty to quote for the whole or any portion of the quantity of any item or state that the rate quoted shall apply if the entire quantity of any such item is taken from you.
8. Where offers by the tenderer are for stores imported with the assistance of the State Trading Corporation the tenderer should specifically stipulate that the offers made are in accordance with the price fixation formula of the State Trading Corporation.
- 8 (a) In the event of the order being placed against any of the tenderers and if the tenderer fails to supply any stores according to the terms and conditions of acceptance of tender or fails to replace any stores rejected by the P.O. or by any person on his behalf within such time as may be stipulated, the Purchasing Officer shall be entitled to purchase such stores from any other source and at such price as the Purchasing Officer shall in his sole discretion think fit.

If action as stipulated above is taken:

01. The offer of the defaulting contractor/supplier will not be considered.
02. The defaulting contractor/supplier will be penalized to the extent of the difference in the rates or 10 per cent of the value of the earlier order, whichever is higher.
03. If the defaulting contractor fails to pay the penalty he will be permanently delisted from the list of approved contractors of the P.O. and the registration deposit of the contractors will be forfeited to Government.
09. In the case of non-delivery and / or delayed delivery against an order placed with you, the Purchasing Officer, reserves to himself the right to impose such penalty in his sole discretion as he think is fit.
10. (a) **Tenders should be accompanied by Earnest Money as indicated in Schedule attached. The Earnest Money will be forfeited if you fail to complete the contract according to your tender, if accepted. Tender without Earnest Money may not be considered.**  
  
(b) Successful Tenderers will be required to pay a sum fixed by the Purchasing officer as security deposit i.e.2% and enter into agreement for the performance of the contractor. **The security deposit will be returned to the vendor after the expiry of warranty/Guarantee period.**

11. **Samples** :- Tender samples are not required unless specifically called for. Tenders without samples where samples are specifically called for are liable not to be considered. Samples should be affixed with a label showing: -  
(a) Name and address of the firm  
(b) Tender No.  
(c) Opening date of tender
12. Tenderers convicted of an offence under the Bombay Prohibition Act, 1949, or the Bombay Opium Act, 1936, will be considered ineligible for being given contracts.
13. **Release of controlled materials**– Tenderers who do not stipulate conditions regarding release of controlled materials may be given preference.
14. **Extension of time** –  
i) As soon as it is apparent that contract dates cannot be adhered to, an application shall be sent to the purchasing officer.  
ii) Without prejudice to the foregoing rights, if such failure to deliver in proper time as aforesaid shall have arisen from any cause, which the purchasing officer may admit as a reasonable ground for an extension of the time (and his decision shall be final). He may allow such additional time as he considers to be justified by the circumstances of the case.  
iii) Provided always that any failure or delay on the part of sub-contractors through their employment may have been sanctioned shall not be admitted as a reasonable ground for any extension of time or for exempting you from liability for any such loss or damage, as aforesaid and provided further that no extension shall be allowed unless application for it shall, in the opinion of the purchasing officer (which shall be final) have been made and in his opinion is justified.  
iv) The purchasing officer (**Registrar**), Dr.B.A. Tech.University reserves the right to call for break-up of the tender where necessary.
14. **General Instructions** :-  
(1) Priced Tender Form should be returned duly filled in, failing which tender will not be considered.  
(2) Tenderers should submit their tender in duplicate.  
(3) S.T., G.T. or VAT should be clearly stated failing which it will be taken as inclusive of all taxes.

(3-A) Any statutory increase, or decrease, as an act of States or the Central Government relating to Sales and other Taxes shall be to the account of the purchaser by a contractor.

(3-B) **Fall Clauses** – It is a condition of the contract that all through the currency thereof, the price at which you will supply the stores should not exceed the lowest price charged by you to any customer during the currency of the rate contract and that in the event of the prices going down below the rate contract prices you shall promptly furnish such information to us to enable to amend the contract rates for subsequent supplies.

(4) Tenderers not on the register of this office should deposit in this office as Earnest Money an amount of **Rs. 5,000/-** and requisite **D.D.** submitted along with the tender failing which the tender will be rejected forthwith.

(5) Exact earliest and clear delivery period should be quoted.

(6) It will be the responsibility of the Tenderer to inform this office within the validity period of the tender in the event of the stores offered ex-stocks being sold elsewhere. Failure to comply with this instruction shall be construed to mean that the stores are available ex-stock during the validity period.

(7) Tenderers should indicate the rates in Metric System of Weights and Measures only.

(8) Tenderers may quote rates for equivalent makes, store also and should indicate specifically the make of spare parts, i.e. genuine, imported equivalent make or indigenous. They are required to give guarantee for premature wear, exact fitness and satisfactory performance of the parts, offered other than the genuine (original manufacture of the machinery).

(9) Ex-stock offer or those on Tenderer's own import license will only be preferred.

(10) Tenderers should state the place of inspection of the stores offered, if the goods are offered for inspection outside Maharashtra State the Tenderers will have to bear all expenditure of inspection carried out by this office.

N.B.- Special consideration would be given in the case of Tenderers quoting the requirements of Maharashtra Government with Indian Standards Specifications and those with quality markings.

Goods should be dispatched at carrier's risk failing which they should be properly covered by transit insurance. However, the supplier will be responsible until the entire store contracted for arrival in good condition at destination.

(11) Please note that Tender Form should be filled in serial order of item Nos. 1,2,3 etc. and rates accordingly typed in **No.4** of the printed Tender Form in original and also on the counterfoil the rate of each item and other details should be given as required under each column. If the specifications are different than those prescribed in the tender, they should be shown on a separate page but rates for these items should be indicated on the printed form. Same procedure should be followed for alternative tender for the same item.

(12) Samples for the quoted items must be submitted along with tender.

(13) Samples destroyed in tests will not be returned and no payment made thereof.

(14) Offers of Small Scale Industries quoting their registration number with the Directorate of Industries, Maharashtra and National Small Scale Industries Corporation (Government of India) shall be only for items of approved programme of manufacture of the contesting Small Scale Industries Unit. Likewise the offers of state Industrial Co-operative Associations, Maharashtra State shall be on behalf of the member Industrial Co-operative Societies only and those of M.S.S.I.D.C., shall be on behalf of S.S.I. Units registered with the Directorate of Industries of Maharashtra State and restricted to products of their own manufacture.

Note :- (1) Tender Samples – Analysis Reports on Tender on Tender Samples will not be furnished to tenderers.

(2) **Tenders offered by Tenderers** – Tenderers should, if not in a position to quote for entire quantity and for delivery as required, state specifically the quantity which they can deliver at the prices quoted and according to the required delivery. Silence on the point will entail responsibility for supply at quoted prices in full quantities as per required delivery.

(3) **Packing** – Packing proposed to be employed should be clearly stated giving details of the charges for all alternative packs.

(4) Failure to observe any of the conditions mentioned above will result in the tenders being summarily rejected.

**INSTRUCTIONS TO THE TENDERER :**

**Please do not forget to Attach :**

1. **Demand Draft** of State Bank Of India in favour of The Registrar, Dr. Babasaheb Ambedkar Technological University, Lonere – Mangaon for the amount of **Rs.5,000/-** against Earnest Money Deposit.
2. Attached copy of authorization certificate issued by Principal Company.
3. Proprietary Certificate
4. Attested copy of Sales Tax Registration Certificate should be attached.
5. The authorized dealer or distributor should have at least three years experience in the development of the **single cylinder four stroke VCR Diesel Engine testrig** and should have supplied to reputed Government institutes/Universities. Attach proofs of the same.

**Important Note:**

Please do note that omission to attach any of the above listed documents shall cause rejection of Tender.

**Registrar**

**DR.BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,  
LONERE –402 103**

**INVITATION OF TENDER  
DETAILED TENDER NOTICE**

1. Sealed tender in B-1 form are invited from authorized dealer/distributor/Principal company.

Tender form, the conditions of the tenders, specifications can be had on cash payment of **Rs.500/-** ( Non-refundable ) per set from the office of the Registrar, Dr.Babasaheb Ambedkar Technological University, Lonere, Tal.Mangaon, Dist Raigad on any working day from **19/09/2011 TO 17/10/2011** during the office hours. Alternatively the form can also be downloaded from our website. However a D.D. drawn in favor of 'The Registrar, Dr. Babasaheb Ambedkar Technological University, Lonere. Dist Raigad. Maharashtra.' Payable at Mangaon is to be attached along with the tender document in envelope I.

- 2) The tender forms duly completed shall be received in the office of the Registrar, Dr.Babasaheb Ambedkar Technological University, Lonere, Tal. Mangaon, Dist. Raigad upto date **18/10/2011 upto 3.00 p.m.** The schedule for opening the tenders will be notified on university's website in due course of time in the presence of such indenting tenderer or his / their representative who may present at that time. Tenders sent by post shall be sent well in advance by registered post and must reach by the above time & date. For late delivery by postal or any other authentic mailing services, the institute shall not be responsible.
- 3) The tenders should be accompanied by the D.D.(for the amount of **Rs.5,000/-**) of State Bank of India, on Mangaon Branch in favour of The Registrar, Dr. Babasaheb Ambedkar Technological University, Lonere, Tal.Mangaon, Dist Raigad as earnest money deposit.
- 4) Earnest money in any other form of cash, Term deposit or Cheque shall not be accepted.
- 5) The amount of earnest money shall be forfeited, in case of successful tenderer does not pay amount of initial security deposit within the time stipulated by the Registrar and complete the tender documents. In all other cases, the earnest money shall be refunded.
- 6) The successful tenderers shall have to pay the security deposit in cash/ **Bank guarantee** i.e. @2%.

- 7) The event of the failure of the tenderer to pay cash security deposit within ten days (unless extended by the Registrar in writing) from the date of receipt of the notice of acceptance of the tender, the earnest money shall be forfeited to the Institute and the acceptance of his tender shall be considered withdrawn. Except that in the event of the notice of acceptance of the tender not being issued within 90 days of the date of opening of the tender, the tenderer shall have to option (to be intimated in writing in good time before the expiry of 90 days period) of withdrawing his tender in which case the earnest money shall be refunded in full. All the tenders shall remain open for the period of 90 days from the date fixed for the opening of the tender and thereafter until it is withdrawn by the tenderer by notice in writing.
- 8) Earnest money of the unsuccessful tenderers will be refunded on their application only after an intimation of rejection of their tender is sent to them or on expiry of the validity period whichever is earlier.
- 9) No pages shall be removed or replaced from the tender.

#### Tendering Procedure :

- 1) Blank tenders can be purchased from the office of The Registrar, Dr. Babasaheb Ambedkar Technological University, Lonere.
- 2) **Manner of submission of the tender and its accompaniments:**  
Tenderer should submit the tender in two separate sealed envelopes as detailed below.
  - A. Envelope No. I (Documents) : The first envelope clearly marked as Envelope No 1 shall contain the following documents.
    - a) D.D.s of State Bank Of India for the amount of the Earnest Money/Tender form fee.
    - b) Sales Tax registration and clearance certificate should be attached.
    - c) Attach experience certificate of last three years in the supply of proposed product and should have supplied to reputed Govt. institutes/Universities.
    - d) Authorization certificate from principal company.
    - e) Proprietary certificate from principal company.

**B.Envelope No. II:** (Tender): The second envelope marked as Envelope No.II Shall contain only the main tender including the stipulations issued by the Institute after the last date of sale of Tender forms. A tender submitted without this would be considered as invalid. The tenderer should quote his offer on schedule B of the tender documents to be submitted only in envelope II. He should not quote this offer anywhere directly or indirectly in Envelope No. I. The manufacturer/dealer/supplier/shall quote for the supply of proposed product as per the details given in the main tender and also based on the detailed set of additional stipulations issued by the Institute as informed to him by letter from Institute, after the last date of sale of tender forms.

**Submission of Tender:**

The two sealed envelopes No. I and II shall be again put together in one common cover and sealed. This sealed cover shall be marked on the left hand top corner

**“Tender for Supply of “ Single cylinder four stroke VCR Diesel Engine testrig”**

The full name and address of the tenderer and the name of the Authorized supplier delivering the sealed cover containing the tender shall be written on the bottom left hand corner. If submitted by Post, the sealed envelope marked as above shall be enclosed in another cover properly addressed and shall be sent by Registered Post. The date and time for the receipt of envelope containing tender shall strictly apply in all cases. The tenderers should ensure that their tender is received by the Registrar, Dr. Babasaheb Ambedkar Technological University, Lonere before the expiry of the date and time. No delays on account of any cause will be entertained for the late receipt of the tender. Tender offered or received after the date and time is over will either not be accepted or if inadvertently accepted will not be opened and shall be returned to the tenderer unopened.

While submitting your tender, the following procedure may please be observed and other points borne in mind.

01. The maker's name must be specified.
02. The “Terms and conditions” for supply and delivery of stores, should be clearly indicated in the tender , stating whether rates quoted are, inclusive of all Taxes, Packing and forwarding charges freight charges etc. not ,  
**However rates offered as including all taxes will be more welcome.**
03. Please mention clearly whether consignment would be Ex-Godown , Ex-shop of F.O.R. dispatching stations. Preferably terms offered as “delivery of consignment of stores, on F.O.R.
04. Tender received after the stipulated date and time may not be taken into consideration.
05. Items tendered should confirm to the specification shown in the attached list when and where, full or no specifications are indicated against items in the list. Kindly furnish your full specification in accordance with accepted standards against each item tendered. Where reference to catalogue is made, the relevant catalogues / pamphlets / Literature should accompany the tender.
06. Your tender should be for all new items and not for second hand.

07. Please state whether items will be available Ex-stock, If not the minimum period for delivery, or for supplying the items or stores.
08. It should be clearly stated whether , Excise duty, Sales Tax, General Tax, Central sales Tax , Insurance Freight or Packing and Forwarding charges, or any other taxes and duties etc. livable.
09. It would be appreciated if illustrated catalogues/ Literature etc are furnished with the tender.
10. This University is registered with the of Scientific & Industrial Research (DSIR) for purposes of availing customs duty exemption in terms of Government Notification No.51/96 customs dated 23<sup>rd</sup> July 1996 and central excise duty exemption in terms of Government Notification No/10/97 Central Excise dated 1<sup>st</sup> March 1997

**Opening of Tenders** : - On the date specified ( if possible ) for the opening of the following procedure shall be adopted for the opening.

- a) Envelope No. I: First of all, Envelope No. I of the tender will be opened to verify its contents as per the requirement. If the various documents contained in this envelope do not meet the requirements of the Institute , a note will be recorded accordingly by the tender opening authority and the said tenderer , Envelope, No.II will not be considered for further action but the same will be recorded.
- b) Envelope No.II: This envelope shall be opened immediately after the opening of the envelope No. I only if the contents of the Envelope I are found to be acceptable to the Institute, the tender rates in **schedule B** shall then be read out.

**Acceptance of Tender** :

01. Acceptance of tender may be communicated to the supplier by Fax or E mail or by Telephone or otherwise by The Registrar, Dr. Babasaheb Ambedkar Technological University, Lonere.
02. The right of not accepting the lowest offer is reserved with The Registrar, Dr. Babasaheb Ambedkar Technological University, Lonere. The acceptance criterion of the tender contains the following procedure.
  - a) Full specification of the proposed Software/equipment to be submitted along with the tender.

- b) Please see “**Submission of Tender**”.
  - c) Financial offer.
  - d) OEM certification and authorized dealer certification from the software manufacturer.
03. A conference if required shall be called by the Registrar to negotiate or ascertain the financial offer given by the tenderer in comparison with the sub clauses mentioned above and the tenderer shall be informed well in advance regarding the date, time and venue of the conference.
04. The right to accept or reject any or all the tenders without assigning any reason thereof is reserved with the **Registrar** Dr. Babasaheb Ambedkar Technological University, Lonere.

**PAYMENT :**

90% payment is to be made on proof of inspection, physical verification, and successful installation of the device by the consignee and remaining 10% will be made after training of the device as per general condition of contract .

# **TECHNICAL SPECIFICATION**

## Detailed Item-wise Technical Specifications

### Item 1.

#### Option A: Single-cylinder 4-stroke Diesel Engine (VCR) Test set-up

Sr. No.	Particulars	Specification
01	Product	4-stroke, 1 - cylinder, Non-computerized Diesel engine test set-up, suitable for testing at varying speed, load and Variable compression ratio (VCR).
02	Engine	Brand new, 4-stroke, 1- cylinder, Diesel engine, Make: Kirloskar or other standard brand Model: Rated power about approx. 7.5 HP @ 1500 rpm, approx. 670 CC, Water cooled, Variable speed, Satisfying BS pollution norms (Bharat stage-IV)
03	Dynamometer	<b>Option 1.</b> Eddy Current Type (Make: Saj test plant pvt ltd, Pune) Suitable for above engine with Panel Board and arrangement to vary load from 0 to full load on engine. OR <b>Option 2.</b> Hydraulic Brake Suitable for above engine with Panel Board
04	Exhaust gas calorimeter system	1.Pipe-in-pipe OR 2.Plate fin type MoC: Cu for tubes, with glass wool insulation & AL Cladding
05	Temperature sensor	RTD / PT 100 / thermocouple K- type (Make: Radix or Equivalent) preferably RTD. Suitable standard digital temperature indicator with selection switch
07	Manual Readings for calculating	Test rig should be able to work out various parameters of the engine (Suitable Panel Board) Eg. 1) Full Load and part load performance 2) Volumetric efficiency 3) Air/fuel ratio at various loads 4) Heat balance sheet and energy studies 5) BP 7) Brake thermal efficiency 8) Indicated thermal efficiency 9) Specific fuel combustion etc 11) Diesel Injection Pressure measurement 12) Digital Speed 13) Combustion analysis 14) Valve Timing analysis
08	Load indicator	Digital display
09	Load Sensor	Electronic type, High accuracy load cell <u>For Dynamometer load</u> – Make: Sensotronic (capacity 0

		~100 kg), Digital display
10	Air Box	MS Fabricated (powder coated) with orifice meter and manometer. Desirable: Stainless steel
11	Fuel Tank	At least 20 lit capacity with glass fuel metering for fuel consumption measurement
12	Rota-meter	1) for Engine cooling water, 2) for Calorimeter water. With suitable range: 25-250 LPH, Make: Eureka Pune.
13	Battery with Battery Charger	Battery: Exide make, Rating: 120 AH Battery Charger: I/p 230 V
14	Base Frame	MS 'C' Channel heavy duty with powder coated
15	Fuel flow transmitter Fuel flow measurement	Burette for manual reading Air box with orifice and U-tube manometer
16	Cordon Shaft	Make: Hindustan, Nashik, with Universal joints & safety guard
21	Accessories	All necessary accessories for the above set-up

**Optional accessories:**

01	Crank angle, cylinder pressure & combustion pressure sensor	Piezo-sensor of PCB electronic Inc for cylinder pressure, 0~5000 psi, with low noise cable, Resolution 1 deg for crank angle with pulse at 5500 RPM
02	Measurement of diesel injection pressure and arrangement to change and measure injection timing	Required instruments of standard make for measurements

**OR**

**Option B: Research Engine Test Setup 1 Cylinder, 4 Stroke,  
Multi-fuel, (VCR) With EGR system (Computerized)**

Sr. no.	Particulars	Specification
1.	<b>Product</b>	Research Engine test setup: 1 cylinder, 4 stroke, Multi-fuel, VCR. Computerized, engine test set-up, suitable for testing at: Multi fuel: Diesel and Petrol operation varying speed, load and Variable compression ratio (VCR) Advancements: Diesel injection point & Spark point advancement Self start: Electric starting arrangement On line results: P $\theta$ -PV plots, IP, IMEP, FP indication & combustion analysis
2.	<b>Engine</b>	Brand new, Type: 1 cylinder, 4 stroke, water cooled. Make: Kirloskar or similar reputed brand <b>Diesel mode:</b> Power 5 kW, Speed 1500 rpm, CR range 12:1-18:1. Injection variation: 0- 25 Deg BTDC <b>Petrol mode:</b> Power 4.5 KW @ 1800 rpm, Speed range 1200-1800 rpm, CR range 6:1-10:1, Spark timing variation: 0-70 deg BTDC Satisfying BS pollution norms (Bharat stage-IV)
3.	<b>Dynamometer</b>	Eddy current type with water cooled. Appropriate capacity to test engine at full load.
4	<b>Propeller shaft</b>	With Universal joints & safety guard. Make: Hindustan, Nasik or equivalent.
5	<b>Air box</b>	M S fabricated (powder coated) with orifice meter and manometer
6	<b>Fuel tank</b>	Capacity approx 15 to 20 lit, Type: Dual compartment, with fuel metering glass
7	<b>Calorimeter</b>	1.Pipe-in-pipe OR 2.Plate fin type, MoC for tube: Cu, with glass wool insulation & AL Cladding
8	<b>Piezo sensor</b>	Combustion: Range 5000 PSI, with low noise cable Diesel line: Range 5000 PSI, with low noise cable or

		RTD / PT 100 / thermocouple K- type (Make: Radix or Equivalent) preferably RTD. Suitable standard digital temperature indicator with selection switch
<b>9</b>	<b>Crank angle sensor</b>	Resolution 1 Deg, Speed 5500 RPM with TDC pulse.
<b>10</b>	<b>Data acquisition device</b>	NI USB-6210, 32-bit, 250kS/s.
<b>11</b>	<b>Piezo powering unit</b>	Make-Cuadra, or any standard equivalent
<b>12</b>	<b>Temperature sensor</b>	Type RTD, PT100 and Thermocouple, Type K
<b>13</b>	<b>Temperature transmitter</b>	Type two wire, Input RTD PT100, Range 0–100 Deg C, and thermocouple K- type (Make: Radix or Equivalent) preferably RTD. Output 4–20 mA and Type two wire, Input Thermocouple,
<b>14</b>	<b>Load indicator</b>	Digital, Range 0-50 Kg, Supply 230VAC
<b>15</b>	<b>Load sensor</b>	Load cell, type strain gauge, range 0-50 Kg
<b>16</b>	<b>Fuel flow transmitter</b>	DP transmitter, Range 0-500 mm WC
<b>17</b>	<b>Air flow transmitter C</b>	Air box with orifice and u-tube manometer or Pressure transmitter, Range (-) 250 mm W
<b>19</b>	<b>Pump</b>	Type Mono block
<b>20</b>	<b>Rota-meter</b>	Engine cooling 40-400 LPH; Calorimeter 25-250 LPH
<b>21</b>	<b>Battery with Battery Charger</b>	Battery: Exide make, Rating: 120 AH Battery Charger: I/p 230 V
<b>22</b>	<b>Accessories</b>	All necessary accessories for the above set-up

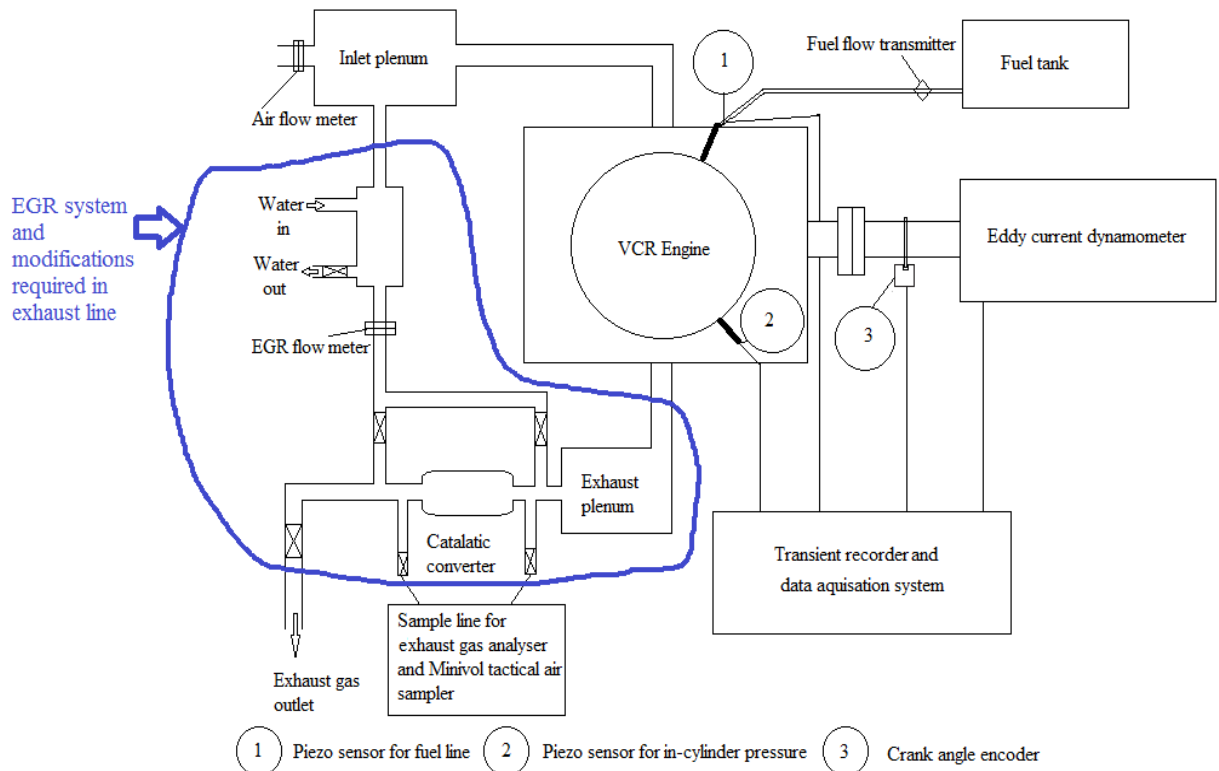
**> VCR Engine with EGR system requirements (Major requirements) are :**

1. Standard Single cylinder 4 stroke multi fuel engine for EGR system as per above mentioned specification.
2. Electric start arrangement.
3. Fuel injection line pressure measurement.
4. Provision for manipulation of fuel injection point.
5. Provision for manipulation for fuel injection pressure.
6. EGR arrangement.
7. Catalytic converter.

- **Following components are required for EGR system:**

1. Surge tank, stainless steel EGR Cooler, control valve- 3 nos.,
2. Digital Manometer/any kind of flow meter- 2 nos., thermocouple-2 nos., piping and connecting Hose.
3. Injection variation range: If possible -40 to +5 CADATDC
4. Injection pressure variation range: 200- 300 bar
5. Inlet valve timing adjustment
6. 8) Two taping to take sample of exhaust gas (before catalytic converter and after catalytic converter) for emission measurement
7. 9) VCR engine with suitable catalytic converter, especially for Biodiesel/Diesel application
8. 10) Cooled Exhaust Gas Recirculation System: 0-75% EGR flow rate, EGR gas, temp. up to 378K

**Setup sketch- EGR system arrangement for VCR engine:**



### **Terms & Conditions:**

1. Supplier has to submit the manuals for each set-up & as well as every subsystems containing **neat schematic diagram of the set-up**, calculation procedure, sample calculations etc.
2. Supplier has to produce the receipt of newly purchased engine & important subsystems like dynamometer etc.
3. Supplier has to give the flow diagram (Outline & diagram) of the setup properly laminated indicating various parameters measured in the set-up with proper nomenclature. Also, a hard copy and CD of the self explanatory operating manual should be supplied by the supplier.
4. Delivery period should be preferably less than 5~8 weeks
5. Supplier need to give warranty of the overall setup as well as for the subsystems
6. Commissioning & demonstration to be done by supplier at no extra cost.
7. Supplier needs to give us the test (Calibration) certificates of various sub systems
8. One test trail to be conducted before dispatch in presence of a member from the university. Also the demonstration has to be done after commissioning on site. The test on the set-up should give performance parameters in the normal range. The supplier has to rectify the set-up if parameters do not come in the normal range.
9. Supplier has to mention the MAKE in offer, wherever it is not mentioned or if it differs from the specification
10. For foundation (if necessary) specification/drawings to be provided by supplier after the confirmation of order well in advance of delivery of equipment.
11. Details about plumbing & electrical connections to be provided by supplier well before commissioning.
12. The installation is under the scope of the supplier at no extra cost.

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**SCHEDULE B**

Sr. No.	Name of the equipment	Qty.	Rate	Remarks
01	<p><b>Option A-</b> Single cylinder four stroke VCR Diesel Engine test set-up</p> <p style="text-align: center;"><b>Or</b></p> <p><b>Option B - Research Engine</b>  <u>Test Setup with Single Cylinder,</u>  <u>4 Stroke, Multi-fuel, VCR</u>  <u>Engine with EGR system</u>  <u>(Computerized)</u></p>	01set		
		01 set		

Seal & Sign of Supplier

NOTE :

01. The Rates quoted must be in accordance with detailed technical specification.
02. The rates quoted are inclusive of all taxes, packing and forwarding charges freight charges etc.