राष्ट्रीय प्रौद्योगिकी संस्थान मेघालय
NATIONAL INSTITUTE OF TECHNOLOGY MEGHALAYA
Bijni Complex, Laitumkhrah, Shillong-793003

Phone : 0364-2501215
Fax : 0364-2501113
Web : http://nitmeghalaya.in/nitmeghalaya/

Ref: NITMGH/ES/CPPP/WORKSHOP/2021-22/1133 **Date: 03.12.2021**

E-NOTICE INVITING TENDER (E-NIT)

FOR

SUPPLY, INSTALLATION, & COMMISSIONING

OF WORKSHOP MACHINES, EQUIPMENT, & SOFTWARE

ON TURNKEY-BASIS

TO BE INSTALLED

AT

NIT MEGHALAYA PERMANENT CAMPUS, SOHRA (CHERRAPUNJEE)

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E-NOTICE INVITING TENDER (E-NIT) FOR SUPPLY, INSTALLATION, & COMMISSIONING OF WORKSHOP MACHINES, EQUIPMENT, & SOFTWARE ON TURNKEY-BASIS TO BE INSTALLED AT NIT MEGHALAYA PERMANENT CAMPUS, SOHRA (CHERRAPUNJEE)

NIT Meghalaya invites online Tenders through **CPP Portal https://eprocure.gov.in/eprocure/app** from eligible Bidders for procurement of equipment.

Prescribed Tender document, detailed fees and specifications, bid instructions and terms & conditions can be downloaded from the CPP Portal (https://eprocure.gov.in/eprocure/app) or from the Institute website (http://www.nitm.ac.in/). However, the bidding process (submission and finalization) will be done in online mode at CPP Portal. The bidders may submit their bid only though uploading in the CPP Portal https://eprocure.gov.in/eprocure/app.

The bidders are requested to read the tender document carefully and ensure complete compliance with all specifications/instructions herein. Non-compliance with specifications/instructions in this document may disqualify the bidders from the tender exercise. The Director, NIT Meghalaya, reserves the right to select the item (in single or multiple units) or to reject any quotation wholly or partly without assigning any reason thereof. Incomplete tenders, amendments, and additions to tender after opening or late tenders are liable to be ignored and rejected.

BID INSTRUCTIONS:

01. The offer must be submitted in Two Bid – Two Files/Covers only through uploading in the CPP Portal before the last date & time for bid submission. Bidders must submit their digitally signed bids. The covers will contain the following documents:

i. Cover 1 which consists of technical requirements and general terms & conditions

ii. Cover 2 which consists of the Price Bid (in BoQ, MS Excel Format).

E-NOTICE INVITING TENDER (E-NIT) FOR SUPPLY, INSTALLATION, & COMMISSIONING OF WORKSHOP MACHINES, EQUIPMENT, & SOFTWARE ON TURNKEY BASIS TO BE INSTALLED AT NIT MEGHALAYA PERMANENT CAMPUS, SOHRA (CHERRAPUNJEE)

Ref: NITMGH/ES/CPPP/WORKSHOP/2021-22/1133 **Date: 03.12.2021**

LAST DATE OF SUBMISSION: - 03.01.2022 at 1:00 p.m.

Technical bids will be opened on 04.01.2022 at 3:30 p.m.

After evaluation of technical bids, financial bids of the technically qualified bidders will be opened on a later date which will be duly notified.

02. Submission of Compliance Certificate: Duly filled and signed Compliance Certificates (as per formats at **Annexure-IA & Annexure-IB**) must be enclosed with the technical bid.

03. Bid not transferable: The bid documents are not transferable and the seal and signature of the authorized official of the firms must appear on all the papers/envelopes submitted.

04. The quantity mentioned for each item in the Annexure-IV may increase/decrease depending on requirements.

05. GST Registration Certificate, up-to-date and valid trade license certificate, and copy of PAN card should be enclosed along with the tender documents.

06. Relevant catalogue of the items must be enclosed.

07. For e-way bill the successful vendor has to apply online via **https://ewaybill.nic.in/ewb.html.**

08. Interested vendors may interact with Dr. K. Debnath for any queries @9402102378 and E-mail Id- kishoredebnath@nitm.ac.in.

QUALIFICATION REQUIREMENTS (Q.R.)

1. **The Bidder/Joint Venture (JV) should be a firm(s) of reputation having sufficient expertise, experience in supply and maintenance of scientific & training equipment and service support capability. The same should be supported by the list of technical persons with their qualification and experience employed in the firm(s).**

2. **The Bidder/JV has to quote for all the items with specifications for all the shops (Machine Shop, Welding Shop, Carpentry Shop, Fitting Shop, Foundry Shop, Electrical Shop, Plumbing Shop, and Automobile Shop) mentioned in the tender as a package and shall execute the Order on Turnkey-Basis at NIT Meghalaya, Sohra Campus (Cherrapunjee).**

3. **The bidder's average annual turnover from sales and services in India should be at least Rs. 20 (Twenty) Crores during FY-2017-18, FY-2018-19, and FY-2019-20. The same should be supported by the following authentic documentary evidence;**
    a. **Audited Balance Sheet with Profit and Loss Account, and**
    b. **Income Tax Return along with Computational of Income**

4. **Proof of successful execution of 3 (three) orders each of value not less than Rs. 3.3 Crores (330 Lacs) of similar products in any IITs/NITs/Central Govt. Institutions/State Govt. Institutions during the FY-2017-18, FY-2018-19, and FY-2019-20 (date of issue of purchase/work order shall be taken as reference). Bidders should enclose relevant documentary proof i.e., Purchase/Work Order Copies stating the supply of similar products & corresponding Completion Certificates from the customer(s) in bidder's favour.**

5. **A joint venture (JV) may apply for the tender if the joint venture existed for the FY-2017-18, FY-2018-19, & FY-2019-20. The same should be supported by the following authentic documentary evidence.**
    (a) **The average annual turnover of the JV from sales and services in India should be at least Rs. 20 (Twenty) Crores during FY-2017-18, FY-2018-19, and FY-2019-20.**
    (b) **Proof of successful execution of 3 (three) orders value of each not less than Rs. 3.3 Crores (330 Lacs) of similar products in any IITs/NITs/Central Govt. Institutions/State Govt. Institutions during the FY-2017-18, FY-2018-19, and FY-2019-20 (date of issue of purchase/work order shall be taken as reference). The JVs should enclose relevant documentary proof i.e., Purchase/Work Order Copies stating the supply of similar products & Order/Project Completion Certificates from the customer(s) in their favour.**

6. **Bidders/JVs not meeting the criteria given above shall be disqualified. The bidders/JVs shall also be disqualified if they have made an untrue or false representation in the forms, statements, and attachments submitted in proof of the qualification requirements or have a record of poor performance, not properly completing the contract, inordinate delays in completion or financial failure and any false declaration.**

NIQ TERMS & CONDITIONS:

01. **Rates: Rates quoted in the Price Bid should be on DOOR DELIVERY at NIT Meghalaya, Sohra Campus(Cherrapunjee) including AMC for 2nd & 3rd year as per the BoQ format.**
02. The Institute reserves the right to select certain items in single or multiple units and reject the others or all and to revise or alter the specifications before acceptance of any tender and accept or reject any or all tenders, wholly or partly or close the tender without assigning any reason whatsoever.
03. **Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specifications, contradiction between bidder specification and supporting documents etc. may lead to rejection of the bid.**
04. Vague terms like "packing, forwarding, transportation, etc." without mentioning the specific amount will not be accepted. Such offers shall be treated as incomplete and rejected.
05. **Quotations have to be submitted in Indian Rupees only**. If goods are to be imported, the quotations shall include all charges for customs clearance, clearing agent fees, landing port handling charges, insurance etc. and onward transportation of the goods from the port/airport of landing for door delivery upto NIT Meghalaya, Sohra Campus (Cherrapunjee).

    NIT Meghalaya has a valid registration with the Department of Scientific and Industrial Research (DSIR), Ministry of Science & Technology, Government of India for availing Customs/Central Excise Duty exemption. NIT Meghalaya will provide all necessary certificates, authorizations and documents required for clearing the consignment and for onward transportation upto NIT Meghalaya, Sohra Campus (Cherrapunjee), Meghalaya.
06. Bidder must unconditionally accept all terms and conditions stipulated in the tender document. All pages of the bid including all enclosures should be numbered and must be duly filled in and sealed and signed by the bidder or his authorized representative.
07. The bidder must also upload a digitally signed copy of the **Tender Acceptance Letter** in the format given at **Annexure-III**.
08. **Validity of Quotation: Quoted rates must be valid for 120 days from the date of quotation**.
09. **Warranty & Annual Maintenance: The Quoted Items must be warranted through proper certification by the Original Equipment Manufacturer (OEM) for a period of minimum 1 (One) Year from the date of successful installation, commissioning, training, & acceptance by the concerned officials of the Institute. The price of extra 2 Years (2nd & 3rd Year) compulsory AMC after the warranty period should be provided by the bidder for the Quoted Items as mentioned in the BoQ.**
10. **Literature: All the quotations must be supported by the printed technical data sheet/literature. The specifications mentioned in the quotation must be reflected/supported by such printed technical datasheet/ literature. The model no. and specifications of quoted items should invariably be highlighted in the datasheets/literature for easy reference.**
11. **Details of supply** of similar items to IITs/NITs/Central Govt. Institutions/State Govt. Institutions must be provided. The same should be supported by the corresponding Purchase/Work Order.
10. **Presentation:** Technically qualified bidders may be called upon to give full presentation on the quoted items at NIT Meghalaya campus before opening of Price bid as a support of their Technical Quotations and clarifications.
11. **Equipment breakdown**: Any Equipment breakdown must be attended by the supplier within 72 hours during the warranty period of the equipment at free of cost.
12. **Training:** Free training is to be provided to NIT Meghalaya personnel on the operation, installation, training, maintenance, and troubleshooting of the supplied items till their satisfaction.
13. **After Sales Service:** Vendor should clearly state the after-sales service facilities/centers available nearest to NIT Meghalaya without which the offer will be rejected.
14. **Dealership Certificate:** The bidder should be either a manufacturer or authorized agent of the foreign/Indian manufacturer. Dealers or Agents quoting on behalf of Manufacturer must enclose valid dealership certificates.

15. **EMD: -** As per OM No. F9/4/2020-PPD issued by the Department of Expenditure, Ministry of Finance, Government of India dated 12.11.2020 vendors are exempted from submission of EMD/Bid Security. However, in lieu of Bid Security, the vendor must submit a **"Bid Security Declaration"** accepting that if they withdraw or modify their bids during period of validity etc., they will be suspended for the time specified in the tender documents.

16. **Performance Bank Guarantee (PBG):** The successful bidder shall furnish an unconditional PBG (as per **Annexure II**) for 3% of the Purchase Order value from a Nationalized/Scheduled Bank of India, before release of the payment. Else 3% of the billed amount will be deducted as security deposit. Where the PBG is obtained by a foreign bank, it shall be endorsed by a Nationalized/Scheduled Indian bank and shall be governed by Indian Laws and be subject to the jurisdiction of courts at Shillong. The PBG shall guarantee that,

    - The Vendor guarantees satisfactory operation of the Equipment & components against poor workmanship, bad quality of materials used, faulty designs and poor performance.
    - The Vendor shall, at his own cost, rectify the defects/replace the items supplied, for defects identified during the period of guarantee/warranty.

    The PBG shall remain valid for period of sixty days beyond the date of completion of all contractual obligations of the supplier including warranty obligations.

    In the event of GoI decides to accept EMD and security deposit on increased/decreased rate the same shall be applicable to the vendor.

17. **The item(s) will be used only for academic and research purpose of the Institute and not for any commercial use. Hence, bidder may quote concessional rate of IGST @ 5%. Relevant documents shall be provided by the Institute.**
18. **The bidder should liaise with the user for timely installation and commissioning of the equipment.**
19. **The supplier shall visit and examine the installation site and its surroundings to obtain all information for itself on its own responsibility immediately upon receipt of the purchase order and suggest the institute for the preparation of the site and other pre-installation requirements. The costs of visiting the site shall be borne by the supplier.**
20. **The supplier must provide complete details (layout drawing of eight shops & major equipment, space requirement, and other infrastructural requirements) to the institute to ensure timely installation, commissioning and training of the equipment and smooth functioning thereafter within 15 days upon receipt of the purchase order.**
21. **Delivery:**
    a. Time Limit: ***Maximum within 120 (One Hundred & Twenty) days from the date of issue of purchase order***.
    b. Safe Delivery: All aspects of safe delivery shall be the exclusive responsibility of the vendor. At the destination site, the package will be opened only in the presence of NIT user/representative and vendor's representative. The intact condition of the package and the seal shall form the basis for certifying the receipt of the items in good condition.
    c. Insurance: The supplier is to establish 'All Risk Transit Insurance' coverage till door delivery at NIT Meghalaya, Sohra Campus (Cherrapunjee).
    d. Part Delivery: No part delivery shall be entertained. However, in extreme cases, acceptance of part delivery shall be a prerogative of the Institute.
    e. Penalty for delay in delivery: The date of delivery should be strictly adhered to otherwise the Director, NIT Meghalaya reserves the right not to accept delivery in part or full. The Director, NIT Meghalaya also reserves the right to impose penalty, as deemed fit, for delay in delivery of the equipment, including imposition of Liquidated Damages (LD). The decision of the Director shall be final and binding to all. Keeping in mind the pandemic situation, bidder should put the best efforts to deliver the items in time.

22. **Genuine Pricing: Vendor is to ensure that quoted price for the particular item is not more than the price quoted to any other customer in India, particularly to IITs/NITs and other Government Organization. Copy of the latest price list for the quoted item, applicable in India, must be enclosed**

with the offer.

23. **Conditional tenders not acceptable:** All the terms and conditions mentioned herein must be strictly adhered to by all the vendors. Conditional tenders shall not be accepted on any ground and shall be rejected straightway. Conditions mentioned in the tender bids submitted by vendors will not be binding on NIT Meghalaya.
24. **Late and delayed tender:** Late and delayed tender will not be considered.
25. **Payment: 80% payment shall be released within 30 (thirty) days from the date of successful completion of delivery, training, installation, commissioning, and acceptance by the concerned officials of the Institute. Remaining 20% payment shall be released within 30 (thirty) days from the date of successful completion of project as per the turnkey contract.**
26. Payment will be made through PFMS. Bidders are required to furnish complete and correct bank details on their letterhead along with the technical bid. A scanned copy of a cancelled cheque must be attached for verification of IFSC code.
27. **No Enquiry during the Evaluation of Tender**: After opening the Technical Bid, no enquiry from the bidder(s) shall be entertained during the course of evaluation of the tender till final decision is conveyed to the successful bidder(s). However, the Purchase Committee or its authorized representative may make enquiries/seek clarification from the bidders. In such a case, the bidder must extend full co- operation. The bidders may also be asked to arrange demonstration of the offered items in a short period of notice.
28. At any time prior to the date of submission of bid, NIT Meghalaya may, for any reason, either of its own or in response to a clarification from a prospective bidder, modify the bidding documents by an amendment/corrigendum. **Any such amendment/corrigendum will be duly notified through the Institute's website and CPP Portal**. Prospective bidders are advised to check the Institute's website every now and then for any amendment/corrigendum. In order to provide reasonable time to take the amendment into account in preparing the bid, NIT Meghalaya may extend the date and time for submission of bids.
29. The acceptance of the quotation will rest solely with the Director, NIT Meghalaya, who in the interest of the Institute is not bound to accept the lowest quotation and reserves the right to himself to reject or partially accept any or all the quotations received without assigning any reasons.
30. **Force Majeure:**

    If the performance of the obligation of either party is rendered commercially impossible by any of the events hereafter mentioned that party shall be under no obligation to perform the agreement under order after giving notice of 15 days from the date of such an event in writing to the other party, and the events referred to are as follows:

    (a) Any law, statute or ordinance, order action or regulations of the Government of India,

    (b) Any kind of natural disaster and Epidemic etc.

    (c) Strikes, acts of the Public enemy, war, insurrections, riots, lockouts, sabotage.
31. **Termination for default:** Default is said to have occurred

    (a) If any of the equipment supplied is found to be substandard, refurbished, un-merchantable or not in accordance with the description/specification or otherwise faulty, the Institute will have the right to reject the equipment or its part. The prices of such equipment shall be refunded by the supplier with 18% interest if payments for such equipment have already been made. All damaged or unapproved goods shall be returned at suppliers cost and risk and the incidental expenses incurred thereon shall be recovered from the supplier. Defective part in equipment, if found before installation and/or during warranty period, shall be replaced within 45 days on receipt of the intimation from this office at the cost and risk of supplier including all other charges. In case supplier fails to replace above item as per above terms & conditions, the Institute may blacklist the supplier.

    (b) If the supplier fails to deliver any or all of the services within the time period(s) specified in the purchase order or any extension thereof granted by NIT Meghalaya.

    (c) If the supplier fails to perform any other obligation(s) under the contract.

Under the above circumstances NIT Meghalaya may terminate the contract/purchase order in whole or in part and forfeit the EMD/PBG as applicable. In addition to above, NIT Meghalaya may at its discretion also take the following actions: NIT Meghalaya may procure, upon such terms and in such manner, as it deems appropriate, goods similar to the undelivered items/products and the defaulting supplier shall be liable to compensate NIT Meghalaya for any extra expenditure involved towards goods and services obtained.

32. Applicable Law:

a. The contract shall be governed by the laws and procedures established by Govt. of India and subject to exclusive jurisdiction of Competent Court and Forum in Shillong, India only.

b. Any dispute arising out of this purchase shall be referred to the Director, NIT Meghalaya, and if either of the parties here to is dissatisfied with the decision, the dispute shall be referred to the decision of an Arbitrator, who should be acceptable to both the parties, to be appointed by the Director of the Institute. The decision of such Arbitrator shall be final and binding on both the parties.

Sd/Registrar

ENCLOUSERS: ANNEXURE-I, ANNEXURE-II, ANNEXURE-III, ANNEXURE-IV

ANNEXURE–I

A. COMPLIANCE CERTIFICATE FOR NIQ TERMS
(To be enclosed in the Technical Bid)

Sl. No.	NIQ Terms and Conditions		Yes/No
1.	Compliance Certificates (Annexure-IA & Annexure-IB) submitted with the technical bid.		
2.	GST Registration Certificate, up-to-date and valid trade license certificate, and copy of PAN card enclosed along with the tender documents.		
3.	Relevant catalogue of the items enclosed. The model no. and specifications of quoted items highlighted for easy reference.		
4.	Conditions mentioned in Qualification Requirements (Q.R.) agreed and fulfilled.		
5.	Rate quoted as per instruction.		
6.	Bidders unconditionally accept all terms and conditions stipulated in the tender document.		
7.	All pages of the bid including all enclosures is numbered and duly filled in and sealed and signed by the bidder or his authorized representative.		
8.	Tender Acceptance Letter in the format given at Annexure-III submitted.		
9.	Validity of quoted rate for 120 days agreed.		
10.	Warranty & Annual Maintenance terms and conditions agreed.		
11.	AMC rate after warranty provided in BOQ.		
12.	Details of supply of similar items to IITs/NITs/Central Govt. Institutions/State Govt. Institutions provided.		
13.	Equipment breakdown clause agreed.		
14.	Training clause agreed.		
15.	After Sales Service: address of after-sales service facilities/centers available nearest to NIT Meghalaya provided.		
16.	Dealership/distributorship certificate (in case of dealers/agents) provided.		
17.	EMD terms agreed.		
18.	"Bid Security Declaration" submitted		
19.	PBG term agreed.		
20.	Delivery terms agreed.		
21.	Payment term agreed.		
22.	Warranty period agreed by OEM.		
23.	Extended AMC year wise for three years (4^{th}, 5^{th}, & 6^{th} year) with rates provided separately.	i. 4^{th} year	
		ii. 5^{th} year	
		iii. 6^{th} year	
24.	Literature: Printed provided.		
25.	Applicable law terms agreed.		
26.	All other terms and conditions mentioned in the NIQ (Technical & Financial) agreed.		

Signature with Seal: …….
Vendor: M/s……

Annexure-I

B. COMPLIANCE CERTIFICATE FOR SPECIFICATIONS

(One for each item must be enclosed in the Technical Bid)

Item Sl. No.		**Item Name:**	
Quoted Product:	**Make:**	**Model No:**	
Specifications as per Annexure-IV		**Quoted Item Specifications***	**Complied/ Deviation**
Parameter	**Specification**		

Signature with Seal: …….

Vendor: M/S……..……

*** Vendor must quote the parameter specification of the quoted item in this column and not just copy the specification from the tender call document. Failure to do so will lead to rejection of the tender.**

ANNEXURE-II

PERFORMANCE BANK GUARANTEE

To:
The Director,
National Institute of Technology Meghalaya
Bijni Complex, Laitumkhrah,
Shillong-793 003Meghalaya

WHEREAS .....(Name of Supplier)
Herein after called "the Supplier" has undertaken, in pursuance of Contract No.....dated,.....20 ....to supply..... (Description of Goods and Services) herein after called "the order".

AND WHEREAS it has been stipulated by you in the said order that the Supplier shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with the Supplier's performance obligations in accordance with the order.

ANDWHEREAS we have agreed to give the Supplier a Guarantee:
THEREFORE WE hereby affirm that we are Guarantors and responsible to you, on behalf of the Supplier, up to a total of ..... (Amount of the Guarantee in Words and Figures) and we undertake to pay you, upon your first written demand declaring the Supplier to be in default under the order and without caviler argument, any sum or sums within the limit of.....
(Amount of Guarantee) as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This guarantee is valid until the.....day of.....20.....

Signature and Seal of Guarantors
.....
.....
.....
Date.....20....
Address:.....
.....
.....

All correspondence with reference to this guarantee shall be made at the following address:

The Director,
National Institute of Technology Meghalaya
Bijni Complex, Laitumkhrah,
Shillong-793003, Meghalaya

ANNEXURE-III

TENDER ACCEPTANCE LETTER
(To be given on Company Letter Head)

Ref. No. …….. Date: ……

To,
The Registrar
National Institute of Technology Meghalaya
Bijni Complex, Laitumkhrah
Shillong 793003, Meghalaya

Sub: Acceptance of Terms & Conditions of Tender.
Tender Reference No.: NITMGH/…… dated ……2021

Name of Tender:- ……..

Sir,

1. I/ We have downloaded / obtained the tender document(s) for the above mentioned Tender from the website of NIT Meghalaya, Shillong as per your advertisement, given in the CPP Portal and the above mentioned website.
2. I / We hereby certify that I / we have read the entire terms and conditions of the tender documents from Page No……to …… (including all annexure(s), schedule(s), etc.), which form part of the contract agreement and I / we shall abide hereby by the terms / conditions / clauses contained therein.
3. The corrigendum(s), if any, issued from time to time by NIT Meghalaya, Shillong, have also been taken into consideration, while submitting this acceptance letter.
4. I / We hereby unconditionally accept the tender conditions of above mentioned tender document(s) /corrigendum(s) in its totality/ entirety.
5. I/We do hereby declare that our Firm has not been blacklisted/debarred by any Govt. Department /Public sector undertaking.
6. I / We certify that all information furnished by our Firm is true & correct and in the event that the information is found to be incorrect/untrue or found violated, then NIT Meghalaya, Shillong shall without giving any notice or reason therefore or summarily reject the bid or terminate the contract, without prejudice to any other rights or remedy including the forfeiture of the full said earnest money deposit absolutely.

Yours Faithfully,

(Signature of the Bidder, with Official Seal)

ANNEXURE-IV

DETAILED TECHNICAL SPECIFICATIONS

Technical Specifications and Compliance

LIST & SPECIFICATIONS FOR MACHINE SHOP

SL. NO.	ITEM DESCRIPTION	QTY
01.	**ALL GEARED PRECISION LATHE MACHINE COMPLETE WITH STANDARD ACCESSORIES:** 3 PH Electric Motor, R/F Switch, 'V' Belts, 2 Mt. Centres with Centre Bush, Inch & mm Gears, Oil Can, Spanner, Allen Key Set & Instruction and Spare Part Manual. **It should have the following Technical Specifications:** • Bed length, mm: at least 1800- 1850 • Centre height, mm: 175-180 or more • Spindle bore, mm: 40-45 or more • Admit between centers, mm: at least 1000 -1050 • Spindle speeds range, rpm: 45 to 938 • No. of spindle speeds: 8 • Motor HP: 2 HP **Special features:** • Lathe bed should be of grade-20 casting, duly flame hardened & ground with Brinell hardness over 300 BHN. • Headstock gears should be made of special alloy steel duly hardened and ground. • Headstock spindle should be hardened and ground and runs in anti-friction taper roller bearings. • Drop worm arrangement should be for instantaneous engagement and disengagement of power feed. • Shear pin coupling as an overload safety device for lead screw. • Safety clutch for feed overload. • Universal gear box should be provided for wide range of inch /mm threads & feeds • Accuracy should be tested as per is: 878 (part - 1) 1971. **Accessories:** 1) Electric coolant pump with tank & fittings - 1 no. 2) Rear tool post with tool holder – 1 no. 3) Taper turning attachment - 1 no. 4) Face plate – 1 no. 5) Steady rest – 1 no. 6) Follow rest – 1 no. 7) Machine lamp with control transformer – 1 no. 8) Quick change tool post with 5 tool holders – 1 no. 9) 10" x 4 jaw independent dog chuck (for use up to 1250 rpm) – 1 no. 10) 6.1/2" x 3 jaw self-centering true chuck (for use up to 1250 rpm) – 1 no. 11) 8" x 3 jaw self-centering true chuck (for use up to 1250 rpm) – 1 no. 12) Chuck flange – 3 nos. 13) Revolving center – 1 no.	08
02.	**ALL GEARED PRECISION LATHE MACHINE WITH LATHE TOOL DYNAMOMETER** **It should have the following Technical Specifications:** **ALL GEARED PRECISION LATHE MACHINE**: ➢ 2 flat and 2 V bed type, all geared precision lathe with flame hardened bed ways with hardness 300 BHN, hardened and profile ground head stock gears, head stock spindle with high tensile strength, hardened and ground material with precision taper roller bearing. ➢ bed length 1500-2500 mm, admit between centers 1000-1200 mm, center height 250-300 mm, swing over bed 500-500 mm, swing over cross slide 300-350 mm, swing in gap 800-850 mm, bed width 250-300 mm, spindle bore 40-60 mm, ➢ spindle nose type A2 size 6, taper MT4, tail stock spindle diameter 50-65 mm, spindle speed 8 no's, spindle speed range (30-1235) rpm, longitudinal speed range (0.064-1.98) mm/rev, transverse speed range (0.016-0.48) mm/rev, threads per range 40/2 to 60 TPI and 20/0.05 to 15 mm. ➢ **Accessories**: Hardened guideway, electricals consisting of electric motor, switch shaft, V belts, catch plate inch / mm gears, set of 2 nos. of dead centers with center bush, oil can, set of allen keys, spanners & instruction	01

	manual, face plate, steady rest, follow rest, electric coolant pump with tank & fittings, taper turning attachment, rear tool post with long cross slide, key way cutting attachment, machine lamp with control transformer, chuck flange (each for every dog chuck / true chuck), 12 inch 4 jaw dog chuck, 12 inch 3 jaw true or self-centered chuck, foot break, MCB. **LATHE TOOL DYNAMOMETER WITH FORCE INDICATOR DISPLAY:** Strain gauge type three axis turning dynamometer capable of measuring the multiple axis loads on the lathe tool is mounted on the tool post of the lathe machine consisting of a sensing block mounted with strain gauge for tool bit size: 25 mm; tool force to measure: up to 500 kgf; sensor resistance: 350 Ω; bridge voltage: 5 V DC; accuracy, linearity and repeatability: < ± 1% of the full scale; operating temperature range: 0-50^{0}C; Multicomponent force indicator display unit suited for strain gauge sensor with 3 channels having resolution of 1 kgf in each direction, display unit is compatible with the dynamometer. **Accessories**: Signal cable of 2 m length to connect the dynamometer to digital indicator (3 Nos.), suitable adapters for the tool bit, additional spare tool bits of sizes 1/2 inch and 1 inch **Fixture**: 1 No with provision for clamping of tool post (of required tool post area) through two T-Slots.	
03.	**HEAVY DUTY ALL GEARED SHAPING MACHINE COMPLETE WITH SWIVEL BASE VICE, AUTOMATIC LUBRICATION, ELECTRICALS & GUARDS** **It should have the following Technical Specifications:** • Capacity: 20-25" or higher • Adjustable Stroke: 600-620 mm • Length of Ram: 1200-1220 mm • Length x Width of Ram Bearing: (1000-1200) x (250-280) mm • Max. & Min. distance from Table to Ram: (450-480) x (80-90) mm • Working Surface of Table: (550-600) x (300-350) mm • Max. Table Travel Horizontal: 700-720 mm • Max. Table Travel Vertical: 350-380 mm • Angular Movement of Table on Either Sides: 60 Degree • Max Size of Tool Shank Accommodated: 50 x 21 • Max. Vertical Travel of Tool Slide: 200-220 mm • Max. Swivel of Tool Head on Either Side: 50-60 Degree • No. of Ram Speeds: 4 • Range of Ram Speeds: 12, 24, 40, 72 SPM • Range of Table Feed Per Stroke of Ram: 0.009 • Motor: 3 HP **Optional Accessories:** 1. Automatic Tool Lifting 2. Keyway Cutting Attachment	**01**
04.	**ALL GEARED UNIVERSAL MILLING MACHINE WITH LONGITUDINAL FEED AUTOMATIC** **It should have the following Technical Specifications:** **Table:** • Working Surface: (1050-1100) x (280-300) mm • No. of T-Slot & Size: 3/M – 12 • Distance between T-Slots: (70-75) mm • Table Swivel: 45° **Range:** • Longitudinal feed (Automatic): 570 -600 mm • Longitudinal feed by hand: 650-700 mm • Cross feed by hand: 200-225 mm • Vertical feed by hand: 360-400 mm • Max. Safe Wt. on Table: 300 Kg **Spindle:** • Spindle Arbour: 25.4 mm • Spindle Nose Taper: ISO 40	**01**

	• Distance from Spindle to Table Min. - Max.: 0-275 mm • Throat Distance with Vertical Head: 250-275 mm • No. of Spindle Speeds: 9 • Range of Spindle Speeds: 60 to 1000 RPM • Spindle Bearing Front: 32211 • Spindle Bearing Rear: 32208 **Feeds:** • No. of Feeds: 6 • Longitudinal Feed: 10, 16, 25, 46, 71, 111 mm / min **Drive:** • Spindle Motor: 2 HP • Table Feed Motor: 0.5 HP • Coolant Pump Motor: 0.1 HP **Accessories:** 1) Swivel Base Milling Machine Vice 100 mm 2) Universal Dividing Head with Indexing Attachment 100 mm With True Chuck 3) Rotary Indexing Table 4) Rack Milling Attachment Grip Type 5) Slotting Attachment Grip Type 6) ISO – 40 Milling Adapter 7) Set of 8 Collets Ranging from 4 to 25.4 mm 8) Clamping Kit 9) Machine Lamp	
05.	**HYDRAULIC HACKSAW MACHINE COMPLETE WITH STANDARD ACCESSORIES: ELECTRIC MOTOR, STARTER, HYDRAULIC PUMP UNIT, MECHANICAL COOLANT PUMP WITH FITTINGS, 'V' BELTS, RIGHT ANGLE VICE & GAUGE STOP** **It should have the following Technical Specifications:** • Cutting Capacity (Round Bar): 300-330 mm • Cutting Capacity (Square Bar): 220-230 mm • Blade Size: 450-500 mm • Electric Motor: 2 HP	**01**
06.	**PILLAR DRILLING MACHINE** **It should have the following Technical Specifications:** • Drilling Capacity (In Steel): 25-30 mm or more • Column Dia.: 85-90 mm • Centre of Spindle to Column: 250-280 mm • Max Spindle to Table: 600-650 mm • Max Spindle to Base: 950-1050 mm • Taper in Spindle: MT-3 • Spindle Travel: 180-185 mm • No. of Speed: 8 • Range of Speed: 73 to 1800 RPM • Table Size: 345 x 345 mm • Base Size: 625 x 420 mm • Overall Height with Guard: 1675 mm • V- Belt Section: B-52 • Elec. Motor: 1 H.P., 1440 RPM **Accessories:** 1. Drill Chuck 0- ½" With Arbour 2. Drill Sleeve 3. Drill Vice – 100 mm 4. Elec. Coolant Pump with Tank & Fittings 5. Machine Lamp	**01**
07.	**ALL GEARED RADIAL DRILLING MACHINE COMPLETE WITH STANDARD ASSESSORIES & FOUR-COMPONENT DRILL DYNAMOMETER**	**01**

	It should have the following Technical Specifications: **Capacity:** • Drilling Capacity in MS (mm): 40-43 • Drilling Capacity in CI (mm): 42-45 • Tapping in MS: 25-30 mm • Rough boring in MS: 50-60 mm **Drill Head:** • Spindle Nose Taper: MT-4 • Spindle Travel: 175 mm • No of Spindle Speed: 8 • Range of Spindle Speed: 60 to 1000 rpm • No. of Power Feed: 2 • Range of Power Feed: 0.20-0.10 mm/rev. **Working range:** • Drilling radius max./min: 1040/530 mm • Distance from column to spindle max./min: 950/440 mm • Distance from spindle base max./min: 1150-320 • Diameter of column: 170-180 mm **Base plate:** • Working surface: (800-870) x (600-630) • No. & size of T-slot: 3/16 mm **Power:** • Drilling motor (two speed): 2/1400 HP/ rpm [50 cycle] 2/2800 HP/ rpm [50 cycle] • Elevation motor for arm: 0.5 HP/1400 HP/RPM [50 cycle] ➢ 2 Nos. Auto Feeds ➢ 3 PH Electric Motors ➢ Control Panel ➢ Box Table with T Slots ➢ Drill Drift ➢ Operation Manual **Dynamometer Description**: The dynamometer must consist of a four-component sensor fitted under high preload between a base plate and a top plate. The four components are measured practically without displacement. It must be taken into account that combined and eccentric loads may reduce the measuring ranges. The sensor is mounted ground isolated. The dynamometer must rustproof and protected against penetration of splash water and cooling agents. Together with the connecting cable. Measuring system for 4-component measurement M_Z, F_X, F_Y, F_Z Must include multichannel charge amplifier, connecting cables, data acquisition and analysis Measuring Range: Fx & Fy: –5 … 5 kN Fz: –5 … 20 kN Mz: –200 … 200 N·m	
08.	**UNIVERSAL NIBBLING MACHINE** **Technical Specifications:** • Capacity of 45 kg/mm^2 and capable of shearing, nibbling, rectangular notching, universal nibbling, slot cutting, louver cutting, beading, folding, flanging, peening, large hole punching and inner circle cutting. • Straight cutting 3.2 mm from edge, 3.2 mm inside with straight hole, 2.5 mm without straight hole. • for figure cutting thickness 1.5 mm; for louver cutting thickness is 2.5mm. • Nibbling from edge 2.5 mm inside with straight hole 2.5 mm without straight hole 2 mm. • for slot cutting sheet thickness 2.5 mm and width of slot 8 mm. • for rectangular cutting sheet thickness 2 mm & width of notch 8 mm. • for folding operation sheet thickness 2 mm & depth of fold 6 mm. • for beading operation sheet thickness 2 mm and depth of bead 4 mm. • for flanging operation sheet thickness 2 mm and height of flange 8 mm.	**01**

	• for dishing operation sheet thickness 2 mm. • Possible range of stroke length (1-8) mm. • Number of strokes per minute 1400; Maximum possible tool life 15 mm. **Accessories**: Two slides for attachment mounting, set of tool holders with figure cutting bits, Electric motor, Push button starter with overload trip, set of operating keys, Set of operating spanner, Anti vibration pad, Hand pushed straight fitting attachment, Circle cutting attachment, Nibbling tool, Beading tool, Rectangular notching tool, Flanging tool, Slot cutting tool, Punching tool, MCB.	
09.	**TEE POWER OPERATED UNDER CRANK GUILLOTINE SHEARING MACHINE** **It should have the following Technical Specifications:** • Steel fabricated heavy-duty construction • Mechanical clutch with spring loaded hold down • Four edged HC blades • Crankshaft and fly wheel shaft run in gun metal bushes • Length: 1250-1300 mm • Thickness: 4-5 mm • Rake angle: 2˚ • Max. back Gauge ADJ: 600 mm • Motor: 5 HP **Accessories:** • Spare blades	**01**
10.	**UNIVERSAL GEAR HOBBING MACHINE** **It should have the following Technical Specifications:** Maximum Module /d.p.c: 4 Module, 6 D.P. Maximum Diameter of Gear: 350 mm, Maximum Width Cut of Spur Gear: 225 mm Maximum width Cut of Helical Gears: Helix Angle 15': 175 mm Helix Angle 30': 150 mm Helix Angle 45': 125 mm Distance between hob spindle and surface of the table Min. With bellows: 127 mm Max. Without Bellows: 350 mm Axial Distance Between Table: 0 to 175 mm Hob Spindle: Diameter of Worktable: 340 mm Maximum Diameter of Hob: 90 mm Maximum Length of Hob: 127 mm Diameter of Work Arbor: 25 mm Diameter of Hob Arbor: 32 mm Hob Speed Range (RPM): 35/50/60/90/115/140 Range of axial feed of hob: 0.2 mm to 4 mm 0.007" to 0.15" Inch slide. Min. to max Main Drive Motor: 1.5 KW 2.0 H.P. Rapid Motor: 0.36 KW 0.5 H.P. Coolant Pump: 0.11KW 0.15H.P. Indexing Gear Set Differential: 50 pieces Gear set: 42 pieces Hob arbor: 01 piece Work arbor: 01 piece	**01**
11.	**UNIVERSAL CYLINDRICAL GRINDING MACHINE (MAIN TABLE & CROSS SLIDE MANUAL)** **It should have the following Technical Specifications:** Center Height: 125/150 mm Admit Between Center: 250-300 mm Max. Swing Over Bed: 200-250 mm Max. Admissible Length: 300-325 mm	**01**

	Wheel Head Speed of Grinding Wheel: 1900 RPM Size of Grinding Wheel: 300x40x127 mm Max. Travel of Wheel Head: 100 mm Rapid Approach: 40 mm Infeed Per Division On: 1 Div. = 0.01 mm Wheel Head Swivel: 45^0 in both direction **Work Head** Spindle Speed: 65, 140, 205, 300 RPM Spindle Morse Taper: MT4 MT Work Head Swivel: 45^0 Towards & Away from Wheel Head **Tail Stock** Morse Taper: MT-3 Quill travel: 25 mm **Table** Max. Travel: 300 mm Max. Swivel on Either Side: 7'+2' deg. Speed of Table: 0.05 to 1.5 m/min Table Width: 250 mm **Electricals** Work Head: 0.037/0.5 H.P./Dual Speed/720-1440 RPM kW Wheel Head: 1.5/2.0 H.P./1440 RPM kW Internal Motor: 0.37/0.5H.P./2800 RPM kW Coolant Pump: 0.07/0.15H.P./2800 RPM kW Power Supply: 440V, 3 Phase AC/50 Cycles **INTERNAL** Spindle Diameter: 60 x 250 mm Min. Dia. of Bore Grinding: 25 mm Max. Dia. of Bore Grinding: 100 mm Min. Dia of Grinding Wheel: 12 mm Max. Dia. of Grinding Wheel: 40 mm Spindle Quill Speed: 15000 RPM Max. Internal Grinding Depth:100 mm Max. Dia. of Quill: 13 mm Max. Length of Quill: 70 mm **Accessories:** I) Internal Grinding Attachment with Internal Grinding Spindle Size: 60x250 mm With Angular Contact Bearing Match Piar P4 Class Spindle Quill: 02 Nos., Flat Belt, 1 HP 2880 RPM Ii) Wheel Balancing Stand Iii) Magnetic Separator 35 Lit.	
12.	**HEAVY DUTY PRECISION PLANERS WITH SINGLE TOOL POST ON CROSS RAIL, STEEL GEARS, AUTO TOOL FEED & AUTO LIFTING OF CROSS SLIDE, LUBRICATION PUMP & ELECTRICALS** **It should have the following Technical Specifications:** Length of Bed: 1900-2000 mm Length of Table: 1300-1500 mm Width of Table: 600-650 mm Stroke of Table: 1200-1250 mm Planning Width: 750-770 mm Hight under Cross Rails: 750-770 mm Cutting Speed P.M.: 400-410" Inches Return Speed P.M.: 580-610" Inches Electrical Belt Driven with Rack & Pinion Method of Driving No. of Tool Post: 1 No. H.P. Required: 2 HP	**01**
13.	**SMART FACTORY AUTOMATION SYSTEM WITH IOT** **Required Components in the Smart Factory Automation System:** **1. CNC LATHE MACHINE – 1 NO.** **2. CNC MILLING MACHINE – 1 NO.**	**01**

3. **ROBOTIC ARM LOADING/UNLOADINGFOR CNC MACHINES - 2 NOS.**
4. **SMART FACTORY AUTOMATION ASSESSMENTS FOR STUDENTS**
5. **SMART FACTORY AUTOMATION WORKSHOP ASSESSMENTS FOR STUDENS**

About the System:

Smart factory automation System should be an integrated, computer-controlled, automated manufacturing system for training that covers material handling systems, CNC equipment, robotics, automated assembly stations, inspection stations that should simultaneously process medium-sized volumes of a variety of parts. The parts produced should be assembled automatically on the assembly station and should be inspected with the help of a built-in Vision System. In addition to this, a CMM should also be used to check the dimensional accuracy of the component produced in the System. The system should be built on the integral principles of modern manufacturing systems.

Smart Warehouse Automation:

The Smart Factory Automated System consists of CNC machines, Robotics & Required Software's should be integrated with the existing system and working as a Smart Factory Automation Setup.

Existing systems as per below:

1. Automatic Storage Retrieval System- 1 No.
2. Automated Guided Vehicle- 1 No.
3. Intermediate Transfer Conveyor- 2 Nos.
4. Vision Inspection System-1 No.
5. Computer Integrated Manufacturing Controller Hardware & Software
6. Internet of Things Gateway for Connected with System.

Technical specification for items:

1. **CNC LATHE MACHINE**

Axes

X- axis travel: Up to 120 mm
Z - axis Travel: Up to 320 mm
Programmable feed rate: Up to10000 mm/min
Rapid feed rate: Up to 30000 mm/min
Axis motor X / Z Type: AC Servo Motor
Slides: Linear Motion Guide ways

Capacity

Chuck size (Manual/ Hydraulic): Up to 165 mm
Chuck Type: Hydraulic
Maximum turning diameter: Up to 200 mm
Maximum turning length: Up to 300 mm
Bed: 45 deg slant bed type
No. of axes: 2 nos.
Swing over cross slide: Up to 126 mm
Distance between centres: Up to 380 mm

Accuracy

Positioning Accuracy: 0.01 mm
Repeatability: ±0.005 mm

Spindle

Spindle nose taper: A2-4
Bore through spindle: Up to 40 mm
Programmable spindle speed: Up to 4000 rpm
Spindle Motor Power S1 (15-minute rating in parenthesis): 5.5 (7.5)/ 3.7 (5.5) kW

CNC Detail

Control system: SIEMENS 828D FANUC 0i TF

Turret

Tool cross section: 20 x 20
No. of Station: 8 (BTP 63) nos.
Indexing Time Adjacent Tool &180 Deg.: 0.4 / 1.4 Sec
Boring bar size (capacity): Up to 32 mm

Tailstock
Tailstock base travel: Up to 260 mm
Tail stroke Quill Stroke: Up to 75 mm
Quill Diameter: Up to 50 mm
Tail stroke Taper: MT-4

Coolant / Lubrication
Capacity: 100/ 25 LPM L
Coolant motor: 0.37 kW
Lubrication: Automatic

Power source
Power Required: 12 kVA
Main supply (±10 %): 415 V, 3 Ph., 50/60 Hz
Stabilizer: 3 phase servo type

Features
Compatibility / Upgradable: FMS / CIM system

Standard Accessories
User Manual CD: 1 No.
Allen Key (full Set): 1 Set
Double Ended Spanner: 1 Set
Screwdriver (Full Set):1 Set
Oilcan: 1 No.
Brush 63 mm: 1 No.
Billets MS: 3 Nos.
Control Box Key: 1 No.
MOP Key: 1 No.
Foot Switch (for Hydraulic Chuck & Tail Stock) Included When Hydraulic Accessories Ordered: 2 Nos.
Ethernet Cable: 1 No.
Chuck Key: 1 No.
Vibration Pad with Bolt: 5 Nos.
Eye Bolt M24: 4 Nos.
Leveling Plate with Bolt: 1 No.
Soft Jaw: 1 Set
Hardened Jaw: 1 Set
Releaser Nut with Spanner: 1 No.
Revolving Center MT4 (Bullet Type): 1 No.
Boring Bar Sleeve with Grub Screw Dia. 6.8, 8, 10, 12, 16, 20 mm: 1 set
Axial Tool Mount: 2 Nos.
Radial Tool Mount: 4 Nos.
Flash Card 2 GB: 1 No.
Adapter (For Fanuc only): 1 No.
Card Reader with Cable: 1 No.
Touchup Paint (Small Can): 1 No.
Air Gun with 8 mm Spiral Hose and Connector: 1 Set

Tooling Package
Turning & Facing Tool Holder with Insert (Shank Size 20 x 20 mm): 1 Set
Copy Turning LH, N, RH Tool Holder with Insert (Shank Size 20 x 20 mm): 1 Set
External Threading Tool Holder with Insert (Shank Size 20 x 20 mm): 1 Set
External Grooving Tool Holder with Insert (Parting up to Dia. 38 mm) (Shank Size 20 x 20 mm), 3 mm: 1 Set
Boring bar tool holder with inserts (12 mm, 16 mm): 2 Set
Internal Threading Tool Holder with Inserts (Shank Dia. 16 mm): 1 Set
Spirex Tap (ISO) M8: 1 Set
Centre Drill (Shank Dia. 8 mm, Tip Dia. 2 mm): 1 Set
Twist Drill (6, 8, 110, 12, 16 mm): 1 Set

2. CNC MILLING MACHINE

Travel
X axis: Up to 600 mm

	Y axis: Up to 500 mm Z axis: Up to 500 mm **Table** Table size: Up to 800 x 450 mm T- Slot (No. x width x pitch): 3 x 18 x 125 / Depth 25 mm Load on table: Up to 500 kg Manual Vice (Width/ Opening): 150/ 110 mm **Spindle** Direct Drive, Cartridge Type Spindle nose to tabletop: Up to 580 mm Spindle to Column: Up to 480 mm Spindle nose taper: BT 40 Spindle output 15 min output (Continuous) Fanuc: 7.5 (5.5) kW Siemens: 7.5 (5.5) kW Programmable spindle speed: Up to 8000 rpm **CNC Detail** Control system FANUC 0i MF Siemens 828D Mitsubishi control option available Programmable feed rate: 0 – 6000 mm/min Rapid feed X/Y/Z: Up to 30000/30000/20000 mm/min Positioning accuracy: 0.01 mm Repeatability: ±0.005 mm Axis motor: AC Servo motor Guideway: Linear motion guide ways Size 35 **Power Source** Main supply: 415 V, 3 Ph., 50 Hz, 64 A **Coolant / Lubrication** Coolant Capacity: 180/25 LPM ltrs. Coolant motor: 0.37 kW for coolant; 0.74 kW for flush coolant Lubrication: Automatic lubrication system **Standard Operations and Maintenance Tools** User Manual CD: 1 No. Allen Key (full Set): 1 Set Double Ended Spanner 6-7, 8-9, 10-11, 12-13, 14-15, 16-17, 18-19, 22-24, 32-36: 1 Set Screwdriver (Full Set): 1 Set Oilcan: 1 No. Brush 63 mm: 1 No. Billets MS 100x100x25 mm: 3 Nos. Control Box Key: 1 No. MOP Key: 1 No. Ethernet Cable: 1 No. Vibration Pad with Bolt: 5 Nos. Eye Bolt M24: 4 Nos. Mechanical Edge Finder (Shank Dia. 10 mm): 1 No. Clamping Kit M12: 1 Set Tool Clamping Fixture BT40: 1 No. Tool Extractor: 1 No. E Type Spanner (E25, E32, E40): 1 Set Flash Card 2 GB: 1 No. Card Reader with Cable: 1 No. Touchup Paint (Small Can): 1 No. Air Gun with 8 mm Spiral Hose and Connector: 1 Set **Automatic Tool Changer** Tool Shank: BT 40	

No of Tool: 20 tools Arm type
Actuation type: Motorized
Maximum tool dia.: 80 mm
Maximum tool length: 250 mm
Max tool weight: 8 kg
Tool change time: 1.4 sec
Chip to Chip Change Time: 6.4 sec

Standard Tool Package
Collet Chuck Holder and Pull stud RD 25-BT40: 2 Nos.
Collet Chuck Holder and Pull stud RD 32-BT40: 1 No.
Drill Chuck Holder and Pull stud BT40/JTA6: 1 No.
End Mill Adapter with holder and Pull stud BT40 Shell End Mill Adaptor 16 mm: 1 No.
Side Lock Holder BT30/ Dia. 16 Side Lock Holder: 1 No.
Drill Collet RD 25 Collets (7-6, 9-8, 10-9 mm), RD 32 Collet (12-11): 1 Set
Tap Collet (ISO) RD 25 ISO Tap Collet Suitable for M8, RD 32 ISO Tap Collet Suitable for M10: 1 Set
Cutter Tools
HSS Shell End Mill Shank Dia.40 mm, Cutter with Dia.16 mm Bore: 1 No.
Twist Drill Dia. 6.8, 8.5, 11 mm: 1 Set
Slot Drill Shank 12 mm: 1 Set
End Mill Shank 12 mm: 1 set
Chamfer Cutter 45° Shank 10 mm: 1 No.
Centre Drill Shank Dia. 8 mm TIP Dia. 2 mm: 1 No.
Boring Bar with Insert Dia. 12 mm: 1 No.
Vice with Handle (110 mm opening): 1 No.

3) 6 AXIS ARTICULATED INDUSTRIAL ROBOT (LOADING/UNLOADING FOR THE CNC MACHINES- ARTICULATED ROBOTIC ARM- 2)

Loading/unloading system should be provided for loading/unloading of work piece in the lathe and milling machine. The buffer storage systems used with loading should be conveyor, which should accept the pallet to and from the AGV.

The articulated Industrial robots should be designed to offer customers sturdy, rugged, high-speed performance driven robotic solution. These robots offer easily accessible automation and productivity solution to customers in small, medium business sectors. The robotic arms are versatile. These 6-axis robots can be adapted for the shop floor environment, with a flexible range of applications: Machine tending, Assembly, Fastener fixing, Soldering, Drilling, Deburring, Conveyor tracking, Vision, Inspection, Pick & place, Laser, Engraving and Glue dispensing, and much more.

Sl. No.	Particulars	Unit	Required Technical Specification
1	Wrist payload	kg	Up to 6
2	Reach	mm	Up to 900
3	Axis	number	6
4	Max speed with rated payload	Degrees /sec	Up to 180 Up to 180 Up to 150 Up to225 Up to 225 Up to 225
5	Max. operation area	degrees	+/-170 0/ +140 +40/-90 +/- 170 +/- 90 +/- 170
6	Position repeatability	mm	±0.07
7	Protection rating		Should be IP54
8	Mounting		Should be floor mounted
9	Features		High performance industrial controllers. Fast Ether CAT communication protocol. Embedded kinematics

		applications. Should be ROS compatibility.
10	Power supply	415 Volt 3 phase.
11	Teach pendant	
12	user manuals	

Smart Factory Automation Assessment for Students:
The following set of assessments can be availed by the customer within 12 months of delivery of the system. Each assessment is online for 60 students.

1. CNC Assessment
2. Automation Assessment
3. Robotics Assessment
4. SFA Assessment
5. IOT Assessment

Smart Factory Automation Workshop for Students:
The following set of workshops can be availed by the customer within 12 months of delivery of the system.
Each workshop is conducted online and up to 60 students can attend.

1. CNC Workshop conducted by the bidder.
- 1 day workshop
- One week access to labs
- 1 month access to learning

2. Robotics Workshop conducted by the bidder.
- 1 day workshop
- One week access to labs
- 1 month access to learning

3. Automation Workshop conducted by the bidder.
- 1 day workshop
- One week access to labs
- 1 month access to learning

4. Smart Factory Workshop conducted by the bidder.
- 1 day workshop
- One week access to labs
- 1 month access to learning

5. IOT Workshop conducted by the bidder.
- 1 day workshop
- One week access to labs
- 1 month access to learning

Internet of Things for Both CNC Machines:
An IoT App should be provided connected along with the smart factory setup to monitor the SFA. The required Gateway and cloud platform should be included.

The IoT platform should be able to connect to the Smart warehousing hardware and collect real time data and information to be displayed in the application developed for the same.
The App should be able to capture and analyze.

ADDITIONAL EQUIPMENTS TO BE PROVIDED ALONG WITH THE SMART FACTORY AUTOMATION SYSTEM:

1. Suitable Stabilizer 30 kVA, Three Phases – 1 no.
2. Personal Computer –Number of computers is as per the license for the software and hardware modules purchased. 3. Computers for hardware setup, for offline software's depends on the number of licenses
   - Windows 7 Operating System or higher, minimum 3.0 GHz processor
   - 80 GB Hard disk (minimum requirement); 1GB Graphic card, 2GB RAMDVD Read/Write Drive, USB port.
3. Suitable Compressor - With minimum 200 Liter tank capacity or above, 6 to 8 Bar (100 – psi) – 1 no (for the whole CIM setup).

14.	**ROTARY ULTRASONIC MACHINE** **It should have the following Technical Specifications:** Frequency: 20 kHz Output Power: 1000 W Voltage: 220 V Power Adjusting: Step or continuous Working Time Control: 24 Hours Generator: Digital Generator	**01**
15.	**ELECTRIC DISCHARGE MACHINE** **It should have the following Technical Specifications:** 1. Work tank internal dimensions: upto 800 x 500 x 350 mm 2. Worktable dimensions: upto 550 x 350 mm 3. Traverse (X, Y, Z): 280-300, 200-200, 230-260 mm 4. Maximum job weight: 300 kg 5. Dielectric unit with capacity 400 liters. Filter element: 10 µ paper with 2 Nos. 6. Pulse generator type: MOSFET. 7. Maximum working current: 50 A 8. Maximum MRR (Cu-St): 350 mm^3/min 9. Maximum MRR (Gr-St) (GR-1): 500 mm^3/min 10. Best surface finish (Cu-St): 0.29 µm-Ra 11. Minimum electrode wear: <1.2% 12. Power Supply: 3 phase 415V AC, 50 Hz **Technical Features:** High speed jump AC Servo Definable erosion axis Canned orbiting cycles Adaptive anti-arc and flushing control SAFE machining circuit Windows based O.S.	**01**
16.	**EDM DRILLING MACHINE** **It should have the following Technical Specifications:** EDM Drilling machine with 3 axes DRO and standard accessories. • Electrode diameter - Dia 0.3~Dia 3.0 mm • Z1 axis travel -300 mm • Z2 axis travel (Double Z) – 320 mm • Working table size – (450-500) x (300-320) mm • Working table travel – (400-420) x (300-350) mm • Max. load in the workable – 300 kg • Max. processing current – 30 A • Max. drilling speed: 30 (mm/min) • Max. drilling depth: 0-300 mm • Max. power consumption- 3.5 kVA • Power supply - Customized • Controller type - Automatic Z axis • Capacity of working fluid tank – 30 L • Digital display - DROs for X, Y, Z - axis • Drilling should be done on various conductive materials like steel, copper, aluminium, carbide, etc. • High pressure water pump for continuous work • Function of setting depth: Yes **Standard Accessories:** • Electrode tubes of dia. 0.5 mm & 1 mm -10 Nos. • Electrode guide for above tubes - 1 No. each • Instruction manual - 1 Set • Tool kit - 1 Set	**01**

17.	NON-CONVENTIONAL MACHINING SETUP **It Should Consist of the following:** **A) ELECTRO CHEMICAL MACHINE (ECM)** **B) ELECTRO CHEMICAL DISCHARGE MACHINE (ECDM)** **C) MICRO ELECTRO DISCHARGE MACHINE (MICRO EDM)** **Technical Specifications:** **A) ELECTRO CHEMICAL MACHINE (ECM)** • Tool Area- 10 mm x 30 mm or 15 mm x 20 mm) • Cross Head Stroke- 70-80 mm • Supply- Three Phase 440 V AC • Electrical Output Rating - 0 - 300 Amps. and Voltage from 0 - 25 V DC • Operation Modes- Manual / Automatic • Tool Feed Rate- In the range of 0.03 to 3 mm / min. • Machining Current Limit Setting -0 - 300 Amps. Variable through touch screen. • Machining Voltage Setting - 0- 25 V Variable through touch screen. • Machining Time- 0 to 1999 seconds. • Display- For voltage, output current, feed rate. • Protection- for current overload, short circuit • USB Port- for data storage. • LCD Display Controller- for forward & reverse, feed rate settings, feed rate display • Facility- Micromachining **B) ELECTRO CHEMICAL DISCHARGE MACHINE (ECDM)** • Cross Head Stroke: 50-55 mm • X-Y Movement: 50-60 mm X 50-60 MM • Supply: Three Phase 440 V AC • Electrical Output Rating: 0 - 10 Amps and Voltage from 0 - 110 V DC • Pulse Frequency: 0.001 kHz to 1000 kHz • Operation Modes: Manual / Automatic • Tool Feed Rate: In the range of 0.03 to 0.9 mm / min. • Machining Current Limit Setting: 0 - 30 Amps. Variable through touch screen. • Machining Voltage Setting: 0- 110 V Variable through touch screen. • Machining Time: 0 to 1999 seconds. • Display: for voltage, output current, feed rate • Protection: for current overload, short circuit, etc. • USB Port: for data storage. • LCD Touch Screen Controller: for forward & reverse, feed rate settings, feed rate display, positioning of sample, etc. **C) MICRO ELECTRO DISCHARGE MACHINE (MICRO-EDM)** • Cross Head Stroke: 50-60 mm • X-Y Movement: 50 mm X 50 mm • Supply: Three Phase 440 V AC • Electrical Output Rating: 0 - 10 Amps and Voltage from 0 - 110 V DC • Pulse Frequency: 0.001 kHz to 1000 kHz • Operation Modes: Manual / Automatic • Tool Feed Rate: In the range of 0.03 to 0.9 mm / min. • Machining Current Limit Setting: 0 - 30 Amps. Variable through touch screen. • Machining Voltage Setting: 0- 110 V Variable through touch screen. • Machining Time: 0 to 1999 seconds. • Display: for voltage, output current, feed rate, etc. • Protection: for current overload, short circuit, etc. • USB Port: for data storage. • LCD Touch Screen Controller: for forward & reverse, feed rate settings, feed rate display, positioning of sample, etc.	**01**
18.	**SERVO CLOSED LOOP CONTROLLED COMPUTERISED WITH HYDRAULIC GRIP UNIVERSAL TESTING MACHINE 2000 KN CAPACITY ALONG WITH DESKTOP COMPUTER, PRINTER, UPS AND SOFTWARE**	**01**

	Technical Data Machine Construction: 6 pillars Measuring Capacity in kN: 2000 Measuring Range in kN: 0-2000 Least Count in kN for Servo Computerized Version: 0.01 Load Range in kN with Accuracy of Measurement +/- 1%: 40-2000 Resolution of Piston Movement in mm: 0.01 Max. Tensile Clearance at Full Descended Piston Position in mm: 50-900 Max. Clearance for Compression Test in mm: 0-900 Distance Between Columns in mm: 700-750 Piston Stroke in mm: 200-250 Max. Straining Speed at No Load in mm/min: 45-50 Middle Cross Head Travel Speed in mm/min: 300-320 Load Control Rate: 0.1 kN/sec to 50 kN/sec Displacement Control Rage: 0.01 mm/sec-1 mm/sec Power Supply 3 Phase, 415 volts, 50 Hz, AC H.P. (total): 7.5 **Standard Accessories** Tension test jaws for round specimens (mm): 10-25 25-40 40-70 For flat specimen thickness in mm : 0-20 For flat specimen thickness in mm : 20-40 For flat specimen thickness in mm : 40-70 Max. width of flat specimen : 75 Transverse Test Adjustable roller support of width in mm : 170 Diameter in mm : 50 With maximum adjustable clearance in mm : 900 Punch tops of radius in mm : 30 Punch tops of Radius in mm : 40 Pair of compression plates of dia. in mm : 250 **Computer** Intel Core i5, 500 GB HDD, 4 GB DDR RAM, 4 USB ports, Keyboard, Mouse, 19" LCD monitor, UPS 500 VA, Deskjet Color Printer **Electronic Extensometer** Strain gauge type with 2.5 mm extension and gauge length 50 & 100 mm.	
19	**HYDRAULIC SHOP PRESS** Capacity: 10-12 TON Length: up to 600 mm Width: up to 500 mm Height: 1100-1300 mm Working Range: 600-650 mm	**01**
20	**SLOTTING MACHINE, 10-12"** Adjustable Stroke: 10-200 mm Longitudinal Movement: 200-250 mm Cross Movement: 200-250 mm Speed Movement: 3 Speed Ram Adjustment: 200-280 mm	**01**
21	**MANUAL BENDING MACHINE** Max Bending Radius: 50-100 mm Bending Material: Mild Steel Power Source: Manual Automation Grade: Manual	**01**

22	**PRODUCTION TYPE CNC MILLING MACHINE ALONG WITH 20 STATION ATC & SERVO VOLTAGE STABILISER** **Specification Should Have** **Travel** Travel in X- 500-600 mm Travel in Y- 500-550 mm Travel in Z- 450-500 mm **Capacity** Table size- 700 x 320 mm or more Max table load- 300 kg or more **Control** Fanuc Oi MF Or Siemens 828D **SPINDLE** Spindle Taper Size BT – 40 Spindle Speed Range rpm 8000 Spindle Motor Power (15 min. Rating kW 7.5 (5.5) (Continuous Rating) **AXES** Position accuracy- 10 μ Axis repeatability- ± 5 μ Rapid traverse rate X/Y/Z- 30000/30000/20000 mm/min Programmable feed rate- 10000 mm/min **Power Supply** Main Supply- 415V, AC Three Phase **Coolant System** Tank Capacity- 180 Lit. or higher Pump Motor- at least 0.37 kW **Accessories Along with the System:** 1. 20 Station Automatic Tool Changer: 1 No. 2. Tool Package for Milling Machine: 1 Set 3. 24 kVA Servo Voltage Stabilizer 4. 100 Lit. Compressor	01

LIST & SPECIFICATIONS FOR WELDING SHOP

SL. NO.	ITEM	DETAILS TECHNICAL SPECIFICATION	QTY.
1.	TRAINEE WELDING BOOTH	**TRAINEE WELDING BOOTH** **Technical Specifications:** 1. Should be made of ecofriendly material MS sheet of 16 gauge or more. No Asbestos to be used. 2. Heavy duty box type structure with glass wool between two sheets to absorb heat and sound should be provided. 3. Provision of fume collection from the top and spatter, slag, dust and waste should be provided. 4. Collection tray at the bottom of the workplace should be provided. 5. Provision for holder / torch mounting should be provided.	2
2.	MASTER WELDING BOOTH	**MASTER WELDING BOOTH** **Technical Specifications:** 1. Should be made of ecofriendly material MS sheet of 16 gauge or more. No Asbestos to be used. 2. Heavy duty box type structure with glass wool between two sheets to absorb heat and sound should be provided. 3. Provision of fume collection from the top and spatter, slag, dust, and waste should be provided. 4. Collection tray at the bottom of the workplace should be provided. 5. Storage facility with two compartments to be provided at the bottom of the waste collection tray 6. Booths should be painted with heat resistant silicon based synthetic epoxy paint. 7. Welding fixtures for all position welding should be provided.	2
3.	WORKTABLE	**WORKTABLE** **Technical Specifications:** 1. Made of MS and ply. 2. Size: Standard. 3. Fitted with magnetic board and LED tubelight. 4. Fitted with one no. bench vice. 5. Fitted with 2 nos. power supply socket.	5
4.	HIGH PRECISION WELDING TABLE	**HIGH PRECISION WELDING TABLE** The welding table should be provided with the combination of accurate preparation of components, a precise working basis for assembling components as well as universal clamping element and stops which results in time savings even for single piece production. The welding table should consist of engraved grid pattern of 100 X 100 mm or higher on the surface of the tabletop facilitates straight and angular alignment. The worktable should consist of T slots which allow continuously positioning of all the clamping elements and stops at any point of the table. • Working Area: 2000 mm X 1000 mm or higher • Max. Height: at least 945 mm, the height should be adjustable from at least 835 mm to 945 mm. • The tabletop should be covered with grey cast iron rails /non ferritic rails with a spacing of 100 X 100 mm. • Design of the bench should be modular and should be extended with the help of extra legs. **<u>List of clamps to be provided with the work bench</u>** • 6 Pcs. clamping arm (∅ 30 mm) • 6 Pcs. clamping tower (∅ 30 x 350 mm) • 4 Pcs. flat clamp • 4 Pcs. clamping arm (∅ 50 mm) • 4 Pcs. support arm (∅ 50 mm)	1

		• 4 Pcs. clamping tower (∅ 50 x 900 mm) • 5 Pcs. try square (table edge) (70 mm) • 6 Pcs. flat stop (170 X 40 X 20 mm) • 4 Pcs. try square (tabletop) (100 X 170 mm) • 2 Pcs. try square (tabletop) (170 X 170 mm) • 1 Pc. continuously adjustable angle (350 x 350 mm) • 2 Pcs. universal stop (350 x 350 mm)	
5.	**MMA WELDING MACHINE**	**MMA WELDING MACHINE** **Features:** 1. MMA / Lift arc selection switch 2. Adjustable arc force & hot start current 3. Suitable for all acid, basic, stainless, low hydrogen electrodes 4. Digital display for voltage and current 5. High quality and stable performance 6. High duty cycle. 7. Stable arc and excellent welding seam 8. Suitable for up to 5 mm electrodes 9. Inbuilt voltage reduction device. **Specification:** ➢ Input voltage: 415 (± 10%) V ➢ Phase: 3 ➢ Frequency: 50 Hz ➢ Open circuit voltage: 72 V ➢ Output current range: 30-400 A ➢ Rated input power: 18 KVA ➢ Rated output voltage: 36 V ➢ Efficiency: >85 % ➢ Welding current at 60% duty cycle 400 A, at 100% duty cycle 310 A ➢ Insulation F ➢ Protection IP 21S **Standard Scope of Supply** 1. Earthing clamp with 3 m welding cable. 2. Power source. 3. Electrode holder with 3 m welding cable	**2**
6.	**CC/CV GMAW MACHINE**	**CC/CV GMAW MACHINE** **Features:** 1. Advanced inverter technology with dynamic response. 2. Energy efficient & high duty cycle power source. 3. Power source with CC /CV Option. 4. Hot start & arc force adjustment on front panel. 5. Adjustable crater current & voltage facility. 6. Universal power source for MIG, MMA & TIG scratch start process & gouging. 7. Precise feed control for arc accuracy & stability. 8. Suitable option for flux cored & solid wires. 9. Welding control mounted on front panel & wire feeder. 10. Four-wheel drive for consistency in wire feed with creep feeding. 11. 2/4 stroke facility. 12. Torch mounted bracket on side panel of enclosed wire feeder. **Specification:** ➢ Input voltage – 415 V AC (± 10%) ➢ 3 PH, 50 HZ ➢ Rated input capacity – 17 kVA ➢ Rated input current 29 A ➢ Welding current at 60% duty cycle 400 A, 100% duty cycle 310 A ➢ Output current range – 50 – 400 A ➢ Efficiency >85% ➢ Power factor – 0.9 ➢ Insulation class –H type ➢ Protection class IP23 ➢ Open circuit voltage – 75 V	**2**

		Standard Accessories: 1. Power source 2. Inbuilt wire feeder 3. MIG torch	
7.	**AC/DC TIG WELDING MACHINE**	**AC/DC TIG WELDING MACHINE** **Features:** 1. Multi functions: AC square wave TIG, DC Pulse TIG, MMA & SPOT TIG welding. 2. Microprocessor control technology. 3. Parameters in panel can be set by coordinate-type touch key; and single knob make the operation simple. 4. Multi adjustable parameters for each of the five welding states. 5. All parameters under the five welding. States can be stored in memory channel. 6. Protective functions for overheat over current & under voltage. 7. Suitable for Al, Mg & their alloys for TIG welding & is suitable for all kinds of acid & Basic electrode MMA welding. 8. TIG Features ➢ Slope up times -0.01-10 sec ➢ Slope down times – 0.01 sec – 10 sec ➢ Pre flow times – 0.1-1.5 sec ➢ Post flow times – 1-15 sec ➢ Frequency- 0.5-200 Hz ➢ AC frequency – 5-150 Hz ➢ Pulse R ➢ AC balance – 10-50%. **Specification:** • Input voltage – 415 V AC (± 10%) • 3 PH • 50 Hz • Rated input capacity – 17 kVA • Rated input current 17.8 A • Welding current at 100% duty cycle 315 A • Output current range TIG – 20 – 315 A • Efficiency >85% • Power factor – 0.8 • Insulation class –F type • Protection class IP21 S • Open circuit voltage – 66 V **Standard Accessories:** 1. Power source 2. Air cooled TIG torch 3. Earthing clamp with cable	**1**
8.	**MIG/MAG WELDING MACHINE (50-400 AMPS)**	**MIG/MAG WELDING MACHINE (50-400 AMPS)** **Features:** 1. Advanced inverter technology with dynamic response. 2. Energy efficient & high duty cycle power source. 3. Power source with CC /CV option. 4. Hot start & arc force adjustment on front panel. 5. Adjustable crater current & voltage facility. 6. Universal power source for MIG, MMA & TIG scratch start process & gouging. 7. Precise feed control for arc accuracy & stability. 8. Suitable option for flux cored & solid wires. 9. Welding control mounted on front panel & wire feeder. 10. Four-wheel drive for consistency in wire feed with creep feeding. 11. 2/4 stroke facility. 12. Torch mounted bracket on side panel of enclosed wire feeder. **Specification:** Input voltage – at least 415 V AC (± 10%), 3 PH, 50 Hz, Rated input capacity – 17 kVA,	**1**

		Rated input current 29 A, Welding current at 60% duty cycle 400 A, 100% duty cycle 310 A, Output current range – 50 – 400 A, efficiency >85%, Power factor – 0.9, Insulation class –H type, Protection class IP23, Open circuit voltage – 75 V	
9.	**PULSED DC TIG WELDING MACHINE**	**PULSED DC TIG WELDING MACHINE** **Features:** 1. Multi-functions: MMA welding, DC TIG welding and pulse TIG welding. 2. Adjustable: arc force, welding current, slope down time and pulse peak currents for pulse TIG. 3. Digital display and precise preset of welding current. 4. Non-contact high frequency arc striking for TIG welding. 5. Protective functions for overheat over-current and under-voltage. 6. Pulse frequency adjuster (DC TIG). 7. Slope down time adjuster (DC TIG & Pulse TIG). **Specification:** ➢ Input voltage 150-260 V ➢ Phase No. 1 ➢ Frequency 50 / 60 Hz ➢ Open circuit voltage 57 V ➢ Current range (MMA/TIG) 5-160 A / 5-200 A ➢ Welding current at 35% duty cycle 200 A ➢ Welding current (MMA/TIG) at 60% duty cycle 150 A ➢ 100% duty cycle 120 A ➢ Power consumption 35% duty cycle 4.4 / 5.3 kVA ➢ Power consumption (MMA/TIG) 60% duty cycle 4.2 kVA ➢ 100% duty cycle 2.1 kVA ➢ Rated input capacity 5.3 kVA ➢ Insulation class F ➢ Protection type IP 21S	**1**
10	**SYNERGIC PULSED GMAW MACHINE**	**SYNERGIC PULSED GMAW MACHINE** **Features:** ➢ Multiprocessor power sources: MMA DC/ MMA pulse - TIG lift DC/ Pulse - MIG/MAG synergic & synergic pulsed MIG and dual pulse. ➢ Digital control of the welding parameters with synergic curves preset according to used type of material, gas and wire diameter ➢ Ability to store personalized welding parameters up to 500 jobs ➢ +100 synergic curves ➢ Easy/Advance /Expert Program for quickly selecting any program ➢ Feeding mechanism with 4 rolls of large diameter for a precise and constant wire driving ➢ Double groove rolls replaceable without any tool ➢ Energy saving function to operate the power source cooling fan and torch water cooling only when necessary. ➢ Calibration of welding accessories –to adjust the displayed voltage measurement & energy calculation ➢ Energy –display & energy calculation after welding according to EN1011-1, ISO/TR/8491 & QW-409 ➢ Ability to lock the equipment with access key by password ➢ Internal lighting of motorized roll & wire reel ➢ Viewing window on trap door to check consumption of the filler wire ➢ Reduced energy consumption ➢ Trouble shooting auto-diagnosis feature ➢ Metallic main structure with shockproof fiber compound front panel ➢ Intelligent ventilation management to reduce the power consumption, dust extraction & substation noise ➢ Precise control over welding cycle –Creep speed/soft arc/hot start/up slope/down slope/crater filler/post gas, etc. ➢ VRD – Voltage Reduction Device, inbuilt ➢ Traceability – Trace records all welding steps weld by weld during welding process according to EN ISO 3834. ➢ Possible to integrate with ROBOT & SPM system	**1**

		Specifications: • Three phase input 50/60 Hz: 400 V +/- 15% • Max power connection: 20 kW, protected & compatible power generator (+/- 15%) • Delayed fuse (delayed): 32 A • Power factor/cos φ: 0,98/0,99 • Efficiency degree: 0,.91 • Open circuit voltage: 85 V • Current range: 10-400 A At 100% Duty Cycle- 360 A • Duty cycle at (40°C) At 60% Duty Cycle - 400 A • Wires Ø mm: 0,6-1,6 Steel & Sn Steel • AL -08 to 1.6 mm • CuSi & CuAl – 0.8 to 1.2 mm • MMA DC/Pulse – rutile/basic/Cellulosic electrode 6 mm dia. • EN 60974-1 • EN 60974-5 • EN 60974-10 • Standards: S/CE safety mark • Protection class: IP23 • Insulation class H **Standard Accessories:** 1. Power Source - 1 No. 2. Wire feeder- 1 No. 3. Air cooled MIG torch 4 M 500 A- 1 No. 4. Electrode holder with cable- 1 No. 5. Earthing cable with clamp 600 A, 70 mm^2, 4 M– 1 No. 6. MIG connection between power source & wire feeder – 5 M, 70 mm^2 7. Trolley for power source & wire feeder 8. Regulator with preheater – 1 No.	
11	**ROBOTIC WELDING SYSTEM**	**ROBOTICS WELDING SYSTEM** **Technical Specifications:** Supply voltage 3~ 50/60 Hz: 400 V, -15 % … +20 % Mains connection cable: H07RN-F 4G6 (5 m) Maximum supply current: 23 A No-load voltage (peak): U0 = 85 V – 95 V Open circuit voltage (average): 85 V – 103 V Operating temperature range: 20°C … +40°C Minimum generator power: 35 kVA Degree of protection: IP23S Efficiency (100 % duty cycle): 87% Power factor (at max. current): 0.85 Storage temperature range: 40 °C … +60°C Temperature class (maintransformer): 155 (F) EMC class: A Minimum short circuit power Ssc ofsupply network: 5.5 MVA Welding range: 20 A / 12 V - 350 A / 46 V Output (at 60 % duty cycle): at least 350 A Output (at 100 % duty cycle): at least 330 A Power supply for auxiliary devices: at least 50 V DC / 100 W Max. apparent power: 22 kVA Idle power: m25 W **Welding characteristics** • MIG • 1-MIG • Pulse • Double Pulse **Functions** • The machine must have to initiatethe arc smoothly. • Must be IOT 4.0 compatible. • Must show weld data in the laptop • Must have the option to retrieve the weld data such as current,voltage, gas flow	**1**

		• Communication: Digital, Devicenet **Wire Feeder** Operating temperature range: -20 °C ... +40 °C Degree of protection: IP21S Storage temperature range: -40 °C ... +60 °C EMC class: A Gun connection: Power Pin wire feed mechanism: 4-roll, two motors Wire feed speed adjustment: 0.5 m/min - 25 m/min Operating voltage (safety voltage): 50 V DC **Robot** Type: Hollow arm Number of axes: 6 Protection: IP 40 Mounting: Floor, Inverted Position repeatability: 0.05 mm Path repeatability: 0.35 mm Supply voltage: 380 V Power consumption: ISO cube 0.6 kW or less Robot weight:180 kg or lesser Axis 1 rotation: +170° to -170°, 130°/s Axis 2 arm: +150° to -90°, 140°/s Axis 3 arm: +80° to -100°, 140°/s Axis 4 rotation: +155° to -155°, 320°/s Axis 5 bend: +135° to -135°, 380°/s Axis 6 * turn: +200° to -200°, 460°/s Emission: EMC/EMI shielded Communication: Digital, Devicenet Welding table: Nitrided welding table 3 m x 2 m Pedestal: The pedestal must be of 600 mm or higher. Stabiliser: A suitable stabiliser of capacity minimum 6 kVA or higher Welding Torch: Power pin connector 100% @350 A with pure CO_2 Functions: Collision sensor to be included in the torch	
12	**WELDING SIMULATOR**	**WELDING SIMULATOR** **Technical Specifications:** • Technology-Augmented Reality • Input Supply-Single Phase 230 V • Current Range - SMAW-50A - 240A (2.5, 3.15 & 4 mm Eectrode) • Voltage & Current Range – GMAW 10V – 32 V & 25 A – 270 A (0.8, 1.0, & 1.2 Dia. Wire) • Current Range- GTAW-25 A – 270 A (2.0 Filler Rod) • Parameter Adjustment-Current • Voltage • Wire Feed Speed & Gas Pressure • Weight of the Simulator Unit-Less Than 20 kg. Sturdy & Metal Body Design. • Process Simulated-SMAW, GMAW, FCAW and GTAW • Component Simulation Possibilities Actual Component Simulation & Robotic Integration Possibility • Physical Workpieces-Butt, Fillet, Lap, Pipe to Pipe and Pipe to Plate Joints • Welding Position -1 F to 6 F Positions in Fillet and 1 G to 6 G Positions in Groove • Workshop Skill Training-Provision to Place Workpiece in a Fixed Stand/Locator. The Student Must Learn to Weld Where Workpiece is in a Fixture. • Thickness of Base Material-3 mm, 6 mm & 10 mm • Welding Practice-Workpiece to Provide Minimum 10 Inch Long Weld Bead Practice. • Torch Control - GMAW & GTAW-Two Step and Four Step Controls • Torches - GMAW & GTAW-Real Industrial Torches for Real Feel and Weight (Any Reputed Make Like TBI Or Binzel) • Simulation Methodology-Green Learning with No Real Arc or Real Fumes. • Weld Bead Simulation-Real 3D Simulation.	**1**

		• No Torch Tracking Movement on Monitor with Graphic Imaging • Virtual & Actual-The Workpiece • Torches and Electrode Must be Real Hardware and the Simulation Must be Virtual Objects Visible Though the Reality • Environment Simulation-100% Real Environment Seen Through the Reality Helmet During Welding • Hardware Objects-Hardware Objects are SMAW Holder, SMAW Electrode, GMAW Torch, GTAW Torch, TIG Filler and All Workpieces • Software Accreditation-Software Must be Accredited by Any International Welding Soceity and Designed & Developed by Any Global OEM Except from China • Welding Practice-Practice on Physical Workpiece - Minimum 10 Inch Long Weld Bead • SMAW Welding Practice-During SMAW Welding Practice • Physical Electrode (Hardware) to be Used and the Same Must Retract Simulating the Consumption of Electrode. • Reality Helmet – HD Flat Screen Helmet, Goggle Less Vision for User Comfort. Students /Trainer Using Spectacles Must be Able to Use It Conveniently • Skill Analysis for Torch – Guidance /Analysis for Arc Length Stick Out/Speed Work Angle/Travel Angle & Path	
13.	**SPOT WELDING MACHINE**	**SPOT WELDING MACHINE** **Features:** 1. Excellent welding on all weldable metals. 2. Electronic adjustment of the welding current and time. 3. Synchronous ignition SCR group with phase shift welding current adjustment to eliminate initial transient. 4. Reduced consumption. 5. Water cooled arms. 6. Water cooled copper electrode holders with adjustable height. 7. Self-lubricated pneumatic components to eliminate oil deposits and to safeguard the environment from contaminants. 8. High versatility to all different possible work configurations. 9. Lower arm with adjustable height which can be rotated for use with a longer electrode holder. **SPECIFICATION:** ➢ Single phase input at least 400 V ➢ 50/60 Hz ➢ Rated power at 50% 15 kVA ➢ Max. welding power 23 kVA ➢ Installed power upto 11 kVA ➢ Cross section connecting cables 10 sq mm ➢ Delayed fuse 32 A ➢ Open circuit voltage 2.6 V or more ➢ Short circuit current 10.2 kA ➢ Max. welding current 8.2 kA ➢ Electrode force max (6 bar) 220 daN ➢ Water consumption a 300 kPa (3 bar) – 3.8l/min	**1**
14.	**LASER WELDING MACHINE WITH 1000 W LASER POWER**	**LASER WELDING MACHINE WITH 1000 W LASER POWER INCLIUDING WIRE FEEDER FACILITY & WATER-COOLING CHILLER** **Specification:** 1. Laser Type – Fiber Laser (IPG YLR) 2. Laser Power – 1000 Watt or more 3. Wavelength – 1070 ± 5 nm 4. Welding head – Normal Welding head with Wire feeder 5. Adjustable Power Rate – 5 to 100% 6. Electric Power – 220 V 50 HZ /380 V 50 Hz 7. Consumable Part – Protection Lens, Focusing Lens Nozzle 8. Fibre Length – 10-15 mtr. 9. Cooling Method – Water Chiller	**1**

		Accessories to be provided with the Machine: **WATER COOLING CHILLER** Laser cooling: Chilled water temp 18~25 degrees Celsius. Cooling Capacity: 6 kW Includes water tank with on loop chiller Water inlet: 20°C ~ 5 bar Supply: 25 lt./min	
15.	**SUBMERGD ARC WELDING MACHINE**	**SUBMERGD ARC WELDING MACHINE** **Features:** 1. Alternation of characteristic of constant voltage / current / wide range of output current / welding current and welding voltage as well as travel speed of welding tractor can all be present and displayed digitally / adjustable arc force 2. Welding current and welding voltage / remote/panel control selection / MMA welding and air carbon arc gouging with suitable carbon electrode / Protective functions: over-current, under-voltage and over-load / Tractor traveling mode and direction control function / Welding head site adjustment function. **Specification:** ➢ Input voltage V 415 ± 15% (3 PH / 50~60 Hz) ➢ Input current (max) 100 A ➢ Rated input capacity 65 kVA ➢ 5 Open circuit voltage 71 V ➢ Open circuit instant current 0.3A ➢ Open circuit consumption 200 W ➢ Voltage adjusting range V 20~50 ➢ Current adjusting range A/V 120/25~1250/44 ➢ Rated duty cycle A/V 60%- 1250/44 ➢ Wire-feed rate range m/min 0.5 ~ 2.5 ➢ Welding rate range 6 ~ 72 m/h ➢ Suitable welding wire dia. 3.0 ~ 5.0 mm ➢ Net weight (PS)- upto 100 kg ➢ Net weight –Tractor upto 50 kg **Standard Accessories:** 1. Arc welding power Source. 2. Welding tractor. 3. Earthing cable. 4. Guide rails	**1**
16.	**WELDING FUME EXTRACTION TABLE**	**WELDING FUME EXTRACTION TABLE** **Specifications:** **Feature:** Welding fume extraction table Should be fitted with a back draft kit for optimum division of the extraction capacity. (approx…..70% back draft, 30% downdraft) **Material:** Work Grid: Galvanized Steel Motor Design: IEC B3 **Filters:** Material main filter cartridges: Cellulose/ polyester fibres Number of pleats: 300 or better Filter Surface Area: 2 x 26 m^2 or better Filter class: M according to DIN EN 60335- 2-69 • at particle size 0.3-5 µm • at filtration speed 0.056 m/s (11 ft./min.) or better and equivalent. Filter Function: Capacity to absorb maximum dust and smoke, during welding Efficiency: >99.9% **Performance:** Fan Type: Radial Air Volume: Min. 2500 m^3/h -50 Hz Noise Level: Without option – 50 Hz, 74 dB(A) according to ISO 3746 or less	**1**

		Physical Dimensions & Properties: Min. Dimensions (L x W x H): 1380 x 1005 x 920 mm or more Min. Dimensions in work grid (L x W): 1366 x 750 mm or more Height adjustment: 920 – 970 mm or better **Material:** Work Grid: Galvanized Steel Mains Cord: 5 m (1 m internal, 4 m external) Mains Cord: 3~/4- cored (3 phases, 1 earth) **Air Volume:** 50 Hz: 1.500 CFM 60 Hz: 1.750 CFM **Certification:** CE Certification & IFA-W3 Certification According to EN 15012-1 (50 Hz versions only). Certificate should be attached along with the technical bid	
17.	**AIR COMPRESSOR**	**AIR COMPRESSOR** Type: Air Cooled, Encap Series Tank Mounted Rotary Screw Air Compressor, Single Stage Motor: 5.5 kW/ 7.5 HP, 415 V, 3 Phase/ 50 Hz Induction Motor Working Pressure: 9.5 bar g or 138 psi g or more Maximum Pressure: 9.7 bar g or 141 psi g or more Free Air Delivery: 20 CFM or 0.57 m^3/min or more Noise: 64dB (A) max. Starter: Direct on Line Starter Version: Canopied Tank: 220/270 liters, 10 kg/cm^2, Horizontal, Fitted with Safety Valves, Pressure Gauge and Auto Drainage Valve. Air Dryer Rating: 20 CFM or 0.57 m^3/min Maximum Pressure: 16 bar g or more Cooling Media: Air	**1**
18.	**WELDER PPE**	Personel Pro Welding & Cutting Helmet. With Auto Darkening Helmet & Air Purifying respiratory. **Auto Darkening Helmet Specs:** ➢ Dark Shade-DIN 9-3 ➢ Clear Shade-DIN-4 ➢ Switching Speed-0/2 MS, Arc Sensor-4 ➢ Viewing Area 93 X 43 mm ➢ Optical Glass Ranking – 1/1/1/2 ➢ Technology-Twisted Nanmatic ➢ Vision – Side Visison 160 Deg. ➢ Blinds for Side Vision is Optional ➢ Control – Stepless ➢ Knob ➢ Weight – 581 gm or less ➢ Power- Solar & Battery ➢ Grinding –EN175B ➢ Norms –EN166B, EN 379 ➢ Application – MMAW, MIG, MAG, Grinding. **Specs for PAPR unit:** ➢ Filteration – PRSL ➢ Leakage – TH2 ➢ Running Time – 10 Hrs. ➢ Battery – Lithum Ion Rechargeable Battery with Pre-Filter, Low Battery Alarm, Clogged Filter Alarm, Hose Protection. ➢ Norms – EN 12941 ➢ Weight – 1180 gm or less	**05**
19.	**ULTRASONIC FLAW DETECTOR WITH PHASED ARRAY CAPABILITY**	**ULTRASONIC FLAW DETECTOR WITH PHASED ARRAY CAPABILITY** **General Requirements**: Data storage— 16 GB SDHC card or most standard USB storage device or better Weight: Less than 3.5 kg with battery	**1**

		Operation: By Touch Screen and USB Mouse. **Kit Includes:** AC Adapter, battery, carrying case, SD card, USB flash drive, 2x Anti-Glare screen protectors, Hardware user's manual, USB Key including equipment software user's manuals. Test Modes: Pulse Echo, Time of Flight Diffraction, Through Transmission and Phased Array **Pulsers:** Configuration: 16:64 (16 pulser/receivers; driving up to 64 elements) Automatic probe recognition 2 UT connectors: Lemo 00 Test Mode: Pulse-Echo and Transmit/Receive Pulse Voltage: Phased Array Channel: 40 V, 80 V and 115 V selectable UT Channel: 95 V, 175 V, 340 V Pulse Shape: Negative Square Wave Pulse Width: Adjustable 30 ns to 500 ns of 2.5 resolution Number of focal laws: 256 Output impedance: 35 ohms in pulse echo mode and 30 ohms in pitch catch mode **Receivers:** Gain range Phased Array Channel: 0-80 dB UT Channel: 0-120 dB Input Impedance: 60 ohms in pulse echo mode and 150 ohms in pitch catch mode Bandwidth: 600 kHz-18MHz Data Acquisition: Digitizing frequency 400 MHz (12 bits) after interpolation per 5/4 Digitizer Resolution 12 bits Max PRF 6 kHz or better **Beam Forming** **Scan:** A-Scan, B-Scan, C-Scan, S-Scan, Ray Tracing and TOFD Scan type: Sectorial, Linear and Compound **Display** Size and resolution: 8.4 inch diagonal 800 x 600 pixels Display type: TFT color LCD Touch Screen Encoder: 2 axis encoder line **Batteries and Power Supply:** Li-ion rechargeable battery with minimum 6 Hours operation Temperature range: Operating temperature to be -10°C to 45°C Warranty: Minimum 1 Year IP Rating: Designed to meet IP 66 requirement Shock proof rating: Drop tested according to MIL-STD-810G 516.6 Data Processing: No. of data points-Up to 8192 Real time averaging: PA 2, 4, 8, 16 Rectifier: RF, full wave, half wave+, half wave - Filtering: 3 low passes, 3 band pass and 5 high pass filters	

		TCG: Programmable **Alarms:** Programmable No. of points: minimum 16 Maximum slope: 40 dB/10 ns No. of alarms: minimum 3 nos. (any logical combinations of gates) **Specifications for Phased Array Transducer & Wedge**: No of elements: 64 with 0.6 mm pitch and 10 mm elevation Frequency: 5 MHz Wedges: 0degree nominal longitudinal and 55-degree nominal shear wave	
20	**WELDING SIMULATION SOFTWARE**	**WELDING SIMULATION SOFTWARE** **(i) TEACHING & TRAINING PACKAGE (20 USER LICENSE-PERPETUAL)** **(ii) WELDING AND HEAT TREATMENT SOLUTION (01 USER LICENSE) (LICENSE FOR 1 YEAR FOR 1 USER)** The welding simulation software should be capable of providing virtual welding manufacturing platform, having welding planning for numerous components, weld process, weld passes, clamps and materials and virtual communication between them. It should have a state of the are meshing tool integrated in visual environment of welding simulation as CAD and FEM modelling; a MS Excel based material data manager should be inbuilt to manipulate and generate properties. The database should cover the mostly used materials in automotive, aerospace, chemical, energy, nuclear, and heavy industries; there should be flexibility of defining new material database; all the physics of the materials should be incorporated in material database. There should be state of the art graphic user interface for setting up of virtual welding fabrication in least time; integrated solver in the software should be capable for DMP performance of large weld assembly, solver with complex material multi-physics, welding and heat treatment process, automatic solution for large pressure vessel fabrication. Dissimilar material with cladding, heat treatment and welding considering complete material physics and fabrication details; along with non-assembled computer having core i7 processor, minimum 16 GB RAM, minimum 1 TB.	**1**

LIST & SPECIFICATIONS FOR CARPENTARY SHOP

SR. NO.	ITEM DESCRIPTION	QTY (NOS.)
1.	**MACHINE TOOLS**	
i.	Wood Turning Lathe	**2**
ii.	Surface Planer Machine	**2**
iii.	Universal Cut-off Saw Machine	**1**
iv.	Jig Saw Machine	**2**
v.	Wooden Grinding Machine	**2**
vi.	Disc Sander	**2**
2.	**MEASURING TOOLS**	
i.	Marking gauge, 12"	**15**
iii.	Steel tape, 3 meter	**10**
iv.	Try square, 12"	**15**
v.	Spirit level	**10**
vi.	Steel rule, 12"	**15**
3.	**CUTTING TOOLS**	
i.	Rib saw	**15**
ii.	Firmer chisel	**20**
iii.	Mortise chisel	**20**
4.	**PLANNING TOOLS**	
i.	Metal jack plane	**15**
ii.	Drill bits 1/8" to ½", 10 pc set	**5**
iii.	Claw hammer	**10**
iv.	Mallet hammer	**10**
v.	Ball peen hammer, 800 g	**10**
5.	**HOLDING TOOLS & OTHERS**	
i.	Bench vice no. 4	**15**
ii.	Screwdriver	**5**
iii.	Pincer 8"	**10**
v.	Oil stone	**10**
vi.	Wooden Table: Size: 6′ × 3′	**10**
vii.	Wooden Table: Size: 4′ × 3′	**10**
6.	**CIRCULAR SAW MACHINE** 12" Cap. Raise & Fall Tilting Table Circular Saw Complete with Mitre Gauge, Saw Guard, Motor Pulley & Tool Kit 3 HP 1440 RPM 3 Phase Electric Motor, V-Belt & Fittings – 01 No.	**02**
7.	**WOOD WORKING MACHINE** 13" x 48" or more Capacity surface planner cum thickness planner with circular saw attachment complete with 3 planner blades fitted in cutter block, mitre gauge, motor pulley, motor fixing plate, safety guard for thicknessing, toolkit & manual (folding top) Along with the following Accessories: • 3 HP 1440 RPM 3 Phase Electric Motor V-Belt & Fittings – 1 No. • Grinding Attachment – 1 No. • Drilling Attachment – 1 No. • Moulding Attachment – 1 No	**02**
8.	**BAMBOO CROSSCUT MACHINE** Including 2 HP motor, starter and carbide tipped circular saw 400 mm & 72 teeth Crompton make motor L&T make starter Dynamically balanced spindle Superior quality TCT saw for longer life Germany made tungsten carbide in TCT saw Maximum cutting capacity 120 mm Stand for material collection	**01**
9.	**BAMBOO EXTERNAL KNOT-REMOVING CUM SKIN FINISHING MACHINE (DOUBLE SIDE)** Including 3 HP motor, starter and two carbide tipped external knot removing cutter to clean the external	**01**

	protruding parts of bamboo at external and internal knots before feeding in machines	

LIST & SPECIFICATIONS FOR FITTING SHOP

<table>
<tr><th>SR. NO.</th><th>ITEM DESCRIPTION</th><th>QTY (NOS.)</th></tr>
<tr><td>1.</td><td>PEDESTAL GRINDING MACHINE
Complete with grinding wheel (one fine and one coarse) at each end, fitted with eye shield, starter, wheel guard, standard tool rest, etc.
Wheel size: 180 x 20 mm or more
Wheel centre distance: 400-450 mm
Centre height: 900-950 mm
Motor: 0.5 HP, 3 ph
RPM: 3000 or more</td><td>03</td></tr>
<tr><td>2.</td><td>BENCH GRINDING MACHINE
Double ended bench grinder with grinding wheel at both ends fitted with ball bearing complete with rotary switch, wheel guard and tool rests
Wheel size: 100 x 20 x 12.7 mm or more
HP: 0.25
RPM: 3000 or higher</td><td>03</td></tr>
<tr><td>3.</td><td>POWER HACKSAW MACHINE
Hydraulic type & heavy duty
Cutting capacity round: Minimum 250 mm
Cutting capacity square: Minimum 200 mm
Saw blade 18", stroke per minute 80, motor 1.5 HP, 3 phases with DOL starter</td><td>01</td></tr>
<tr><td>4.</td><td>BAND SAW MACHINE
Cutting Speeds:
1st slow speed: at least 46 m/min
2nd slow speed: at least 92 m/min
Band Saw:
Rated Size: 2450 x 27 x 0.9 or more
Max/min blade length: 240/2460
Blade height: at least 27 mm
Blade width: at least 0.9 mm
Blade saw tension: 1580 – 22500 kg/cm^2
Rated electrical power:
Head spindle motor: 0.70/8.81 KW
Electrical coolant pump motor: 0.1 KW
Max. Installed power: 0.91
Vice:
Vice max. Opening: up to 245 mm

Spindle motor
<table>
<tr><th>No. of poles</th><th>Current (Volts)</th><th>Absorption (Amps)</th><th>Power (Kw)</th><th>RPM</th><th>Band saw speed</th></tr>
<tr><td>2</td><td>380</td><td>2.14</td><td>0.81</td><td>2800</td><td>92 m/min</td></tr>
<tr><td>4</td><td>380</td><td>2.1</td><td>0.7</td><td>1400</td><td>46 m/min</td></tr>
<tr><td colspan="6">Stator wound with enameled copper wire, class H 200^{0}C</td></tr>
<tr><td colspan="6">Class F insulation (limit temperature TL 155^{0}C)</td></tr>
<tr><td colspan="6">IP 55 protection rating</td></tr>
</table>
Electro pump motor
<table>
<tr><th>Voltage (Volts)</th><th>Absorption (Amps)</th><th>Power (KW)</th><th>RPM</th><th>Delivery rate (lt/min)</th><th>Head (mt.)</th></tr>
<tr><td>230</td><td>0.3</td><td>0.1</td><td>2840</td><td>11</td><td>1.5</td></tr>
<tr><td>400</td><td>0.17</td><td>0.1</td><td>2840</td><td>11</td><td>1.5</td></tr>
<tr><td colspan="6">Protection rating IP 55</td></tr>
</table>
<u>Cutting Capacity</u>
<table>
<tr><td>Section</td><td>  </td><td>  </td><td>  </td></tr>
</table></td><td>01</td></tr>
</table>

		0^0	225	200	240 X 160
		45^0	160	140	155 X 115
		60^0	90	90	90 X 90
		45^0	145	125	150 X 100
5.	**HAND DRILLING MACHINE**				**4**
6.	**HOLDING TOOLS**				
i.	Bench vice no. 4				**12**
ii.	Hand vice				**5**
iii.	Pipe vice no. 3				**5**
iv.	Pin vice				**5**
v.	G clamp 6"				**10**
7.	**STRIKING TOOLS**				
i.	Ball peen hammer, 800 g				**10**
ii.	Straight peen hammer, 1 kg				**10**
iii.	Cross peen hammer, 800 g				**10**
8.	**CUTTING TOOLS**				
i.	Flat chisel				**10**
ii.	Round nose chisel				**5**
iii.	Solid frame hack saw				**20**
iv.	Adjustable frame hacksaw				**20**
v.	10" Flat Files				**20**
vi.	10" Square Files				**20**
vii	10" Triangular Files				**20**
viii.	Scraper, 8"				**10**
ix.	Tap and die set ¼ to ½				**5**
x.	Drill bits 1/8" to ½", 10 pc set				**5**
xi.	Hacksaw blade				**10**
xii.	Tin cutter				**5**
9.	**MARKING/MEASURING TOOLS**				
i.	Steel rule, 12"				**10**
ii.	Try square, 12"				**10**
iii	Scriber				**10**
iv.	Combination set				**5**

LIST & SPECIFICATIONS FOR FOUNDRY SHOP

SR. NO.	ITEM DESCRIPTION	QTY (NOS.)
1.	**INDUCTION FURNACE** **Specifications:** Material Loading Capacity: 1-5 kg Melting Time (min): 15 Minutes Automation Grade: Manual Capacity of Crucible (kg): 1 - 5 kg Melting Material: Copper, Cast iron, Steel, Brass Max Temperature (degree Celsius): 1000-1500 Power (KW): 10 Kw Voltage (V): 415V Frequency (Hz): 15000 Hz Melting Capacity: 1 - 5 kg Phases: 3 Power Supply (W): 10000 Cooling Water Temp (deg.): 25	**01**
2.	**TUBE FURNACE** **Specifications:** Maximum temperature: 1700°C or more Working temperature: 1600°C or higher Heating rate: 0 to 15°C per minute Heating element: $MoSi_2$ heating element Temperature accuracy: ±1°C Thermocouple: B type (Pt-Rh) with 99.7% purity Alumina tube Furnace chamber: Three layers of ceramic fiber insulation materials • First layer: 1800°C ceramic fiber board • Second layer: 1600°C ceramic fiber board • Third layer: 1260°C ceramic fiber board Tube • Tube MOC: Alumina tube • Tube dimensions: OD (60 mm) & ID (50 mm), • Heating zone length: 350 mm Temperature controller • Programmable temperature controller • Single program 30 segments for Ramp & Soak • LED Display of SV & PV • Sensor broken indication • Options to view set program • Option to view current step and remaining time Max. vacuum: -0.1 MPa Gas type: Nitrogen, Argon and other inert gas **Standard accessories:** 01 Vacuum pump 01 stainless steel hook One pair thermal glove Power supply: 220 Volts 50 Hz 1 Phase	**01**
3.	**SAND RAMMER** With Sliding Weight, Lifting and Ramming Cam, Standard Specimen Tube, Pedestal Cup and Stripper.	**1**
4.	**BASE BLOCK**	**1**
5.	**TUBE FILLER**	**1**

6.	**COMPATIBILITY TESTER** It must include Compatibility tube, Compatibility scale, and knife cum scraper.	**1**
7.	**PERMEABILITY TESTER [MANUAL]-MANOMETER TYPE** With Air Tank, Water Tank, Manometer Unit, Permeability Chart, 2 Orifices and Syphon Unit. Suitable for Dia. 50 mm & 50 mm standard specimen.	**1**
8.	**UNIVERSAL STRENGTH MACHINE [HYDRAULIC]** Suitable for Compression Strength, Tensile Strength, Transverse Strength with the Help of Attachment Capacity: For High Gauge 13 Kg/Cm^2 & Low Gauge 1.6 kg/Cm^2 on Compression Scale with Compression Pads	**1**
9.	**SHEAR STRENGTH ATTACHMENTS** To determine Shear Strength of mould and core sand samples when mounted on Universal Strength Machine.	**1**
10.	**TENSILE STRENGTH ATTACHMENTS** To determine Tensile strength of chemical bonded mould and core sand samples when mounted on Universal Strength Machine.	**1**
11.	**TRANSVERSE STRENGTH ATTACHMENTS** To determine Transverse strength of chemical bonded mould and core sand samples when mounted on Universal Strength Machine	**1**
12.	**GANG CORE BOX FOR TENSILE SPECIMEN** Core Box to prepare 6 Tensile specimens one time. Specimen Cross section area 5 Sq.cm with CO_2 gas passing facility.	**1**
13.	**GANG CORE BOX FOR TRANSVERSE SPECIMEN** Core Box to prepare 5 Transverse specimen at a time. Specimen Size- 22.36 x 22.36 x 172 mm with CO_2 gas passing facility.	**1**
14.	**RAPID MOISTURE TESTER** To determine moisture % in raw sand and green sand. Capacity 10 % Moisture With Single Pan Electronic Balance, Absorbent Compound and Carrying Case.	**1**
15.	**SAND SIEVER** ▪ Motor - 1/8 Hp Single Phase, Cycles – 50, ▪ Mechanical Timer 0-15 Min. ▪ Sieve Set as per ISS No 53, 75, 106, 150, 212, 300, 425, 600, 850, 1700 Micron. Dia. 200 mm ▪ Sieve Separator. ▪ Electric connection- 230 Volt AC, 50 Cycles. 5 amps ▪ Essential Equipment- AFS calculator	**1**
16.	**ALUMINUM MOLDING BOX 12X12X41/2**	**2**
17.	**ALUMINUM MOLDING BOX 16X16/41/2**	**2**
18.	**MS JACKET 12X12X41/2**	**2**
19.	**MS JACKET 16X16X41/2**	**2**
20.	**FOUNDRY TOOL KITS** Foundry Tool Kit consists of following twenty-five tools: 1) Steel Rammer Round Shape 2) Steel Rammer Square Shape 3) C.I. Peen Hammer 4) Wooden Hand Rammer 5) Wooden Floor Rammer 6) Wooden Peen Rammer 7) Trowel Rectangular Shape 8) Trowel Long Shape 9) Trowel Heart Shape	**1**

	10) Bent Wire (Steel Wire) with Handle. 11) Strike off Bar 12) Yankee Lifter 13) Lifter or Cleaner 14) Heart and Spoon Slick 15) Draw Spike Sharp Edge 16) Draw Spike Threaded 17) Sprue Cutter 18) Wooden Mallet 19) Gate Cutter 20) Smoother and Corner Slick Set 21) Runner and Riser Pin Set 22) Aluminum Smoother 23) Swab 24) Vent Wire 25) Hand Bellow	
21.	**CUPOLA FURNACE** To melt the cast iron for education demo purpose or small production purpose. Coke fired cupola ID 200 mm (8") capacity 80 kg/hrs or more. Consist of Wind box, Bottom & Side doors, Tap slag holes with Spout, Tuyers charging platform with ladder, Manometer, Operating tool set, Blower 1 HP, Moulding box 300x300 mm, Match plate pattern, Ladle – 5 kg, Scrap, cock, lime stone, graphite Powder, Fire clay, Charcoal for one trial. Electric Connection: 440 Volts, 3 Phase, 50 cycles, 1 HP.	**1**
22.	**TILTING FURNACE FOR ALLUMINIUM & BRASS (LPG/DIESEL FIRED)** For melting of Aluminum and Brass Metal only likes Aluminum, Brass, Copper, etc. Fitted with Graphite Crucible, Capacity at least 40 Kg. Outer Shell: M.S. Fabricated with Motorized Blower Fitted with 2 H.P., 3 Phase Electric Motor and Air pipeline. With 5Kg ladle -2 Nos and with overhead Oil Tank Capacity 200 Liters approx. With fire bricks lining. Electric connection-440 volt, 3 phase, 50 cycles	**1**
23.	**C.I. PLATE WITH ALUMINUM PATTERN WITH WOODEN GATING SYSTEM**	**1**
24.	**PIN LIFT MOLDING MACHINE**	**1**
25.	**PERMEABILITY TESTER [ELECTRIC]** To determine porosity in Raw, Green & No-bake sand Electric blower, Speed Regulator, 2 Orifices, Pressure Gauge **Accessories:** i. Mold Permeability Tester Attachments to Permeability Tester ii. Core Permeability Tube Attachments to Permeability Tester iii. Base Permeability Tube Attachments to Permeability Tester	**1**
26.	**ANVIL 100 KG (SINGLE HORN)**	**3**
27.	**LEE VICE, TABLE SIZE - 15" X 24", JAW SIZE - 8" X 30"**	**1**
28.	**ROUND TONGS, LENGTH-18"**	**3**
29.	**SQUARE TONGS, LENGTH-18"**	**3**
30.	**FLAT TONGS, LENGTH-18"**	**3**
31.	**PICK-UP TONGS, LENGTH-18"**	**3**
32.	**SIDE TONGS, LENGTH-18"**	**3**
33.	**RING TONGS, LENGTH-18"**	**3**
34.	**FLATTER, 2 "X 2"X 3"**	**3**

35.	**TOP FULLER, ¼ " TO 1"**	**2**
36.	**BOTTOM FULLER, ¼" TO 1"**	**2**
37.	**BALL PEEN HAMMER WITH HANDLE, 500 G**	**2**
38.	**BALL PEEN HAMMER WITH HANDLE, 750G**	**2**
39.	**BALL PEEN HAMMER WITH HANDLE, 1 KG**	**2**
40.	**DOUBLE FACED SLEDGE HAMMER, 3.5 KG (7 LBS)**	**2**
41.	**HOT CHISEL, CUTTING EDGE ANGLE-30°, LENGTH- 6' & 8"**	**2**
42.	**COLD CHISEL, CUTTING EDGE ANGLE-30°, LENGTH- 6' & 8"**	**2**
43.	**SWAGE BLOCK, 12"X 12" X 4"**	**1**
44.	**POKER 300"**	**3**
45.	**ROUND PUNCH ¼" TO 1", LENGTH-6"**	**3**
46.	**SQUARE PUNCH ¼" TO 1", LENGTH-6"**	**3**
47.	**TOO SWAGE, ¼" TO 1", LENGTH-3"**	**3**
48.	**MOULDING TOOLBOX** Consisting of shavel, riddle, hand rammer, vent hole, slick, lifter, simple swab, bellow, towels-3 types, draws pike, etc.	**1**
49.	**MUFFLE FURNACE** • Temperature: at least 1500°C • Inner Muffle size in mm: at least 300x300x300 • The outer chamber made of MS duly powder coated • Heating element made of Kanthal wire. • Heating chamber surrounded outside by Kanthal wire. • Insulation done by mineral wool and insulation bricks. • Temperature: up to 1200°C Controlled by Digital Temp. Controller cum Indicator. • Working temperature: at least 1500°C	**1**

LIST & SPECIFICATIONS FOR ELECTRICAL SHOP

SR. NO.	ITEM DESCRIPTION	QTY (NOS.)
1.	**PANEL BOARD CONSISTING OF MCB, FUSE, 1 PHASE DIGITAL COMBI METER, 4 LAMP HOLDERS, 5 SWITCHES, ONE REGULATOR, INDICATOR AND TERMINALS TO COMPLETE WIRING** 1) Parallel Wiring of Florescent Lamps 2) Series Wiring of Florescent Lamps (Half Illumination) 3) Staircase Wiring of Lamps (Operation from Two Places) 4) Control a Lamp from Electronic Fan Regulator	**01**
2.	**SMART ENERGY METER-WIFI ENABLED-3 PHASE WITH ANDROID AND IOS APP**	**02**
3.	**MILIVOLT DROP TEST ARRANGEMENT FOR DC ARMATURE** Millivolt drop test arrangement set up for DC Armature complete with center zero Ammeter, Center zero millivolt meter, Stepdown supply, and other indicators. Rocker setting arrangement setup complete with dimmer, step down transformer, switch, millivoltmeter and other arrangements 1 HP / 180 – 220 V / 1500 RPM / Dissectible DC Shunt motor for easy dismantling and assembly operations with special bearings.	**01**
4.	**HANDY COIL WINDING MACHINE** Handy coil winding machines with gear arrangement and counter.	**02**
5.	**MACHINE TEST BENCH SET UP** 5 HP / 3 KW – 220 V / 220 V Separately excited DC / 1500 RPM / Foot Mounted / Ins. Class B / Duty S1 / IP21 / Self fan cooled DC Shunt wound Machine (suitable to run as Motor and Generator) coupled with 100 NM capacity – Inline Torque transducer with Digital Torque Indicator. Proximity type RPM Sensor along with Digital RPM Indicator. Above both must be mounted on a common C Channel base. Base must be extended further to mount and couple standard 90 F, 100 F & 112 Frame machine to couple with this setup for load test and torque measurement. Suitable raiser to couple must be provided. Spare coupling of bore 19, 24 & 28 each one no. must be provided. 3 Phase / 415 V / 5 A Resistive load in 6 steps must be provided for electrical loading. Separate excitation 220 V – 2 A rated must be provided. Phase to phase DC Power supply - 220 V / 20 A rated must be provided to run DC machine as motor	**01**
6.	**CUT SECTION OF MACHINES TO SEE INTERNAL STRUCTURE OF MACHINES AND TO UNDERSTAND LOCATION OF VARIOUS PARTS OF THE MACHINE** a) Working cut section of 0.5 HP DC Motor with Minispec Thyristor controller to Run above DC motor b) Working cut section of 1.0 HP / 3 Phase / Synchronous machine with Synchronous Motor starter having excitation unit interlocked with DOL Starter c) Working cut section of 1.0 HP / 3 Phase / Slipring Induction Motor with DOL Starter for above Motor d) Working cut section of 0.5 HP / 1 Phase / CSCR SQIM with DOL Starter for above Motor e) Working cut section of 3.0 HP / 3 Phase / SQIM DOL Starter for above Motor f) Non-Working cut section of 1.0 HP / 3 Phase / SQIM g) Non-Working cut section of Fractional HP PMSM Motor h) Non-Working cut section of Fractional HP BLDC Motor	**1 Set**
7.	**ELECTRICAL TEST SET CONSISTING OF:**	
A)	**1 HP / 415 V / 3 PHASE AC MOTOR STATOR WITH ALL 6 TERMINALS BROUGHT OUT**	**01**
B)	**2 HP / 415 V / 1440 RPM / 50 HZ. / 3 PHASE / SQ. CAGE INDUCTION MOTOR WITH MECHANICAL LOADING ARRANGEMENT HAVING ROUND DIAL SCALES AND FRICTION BELT WITH DOL STARTER**	**01**
C)	**BATTERY CHARGING AND DISCHARGING** 12 V Adequate Ah rated Battery with compatible low voltage Resistive load bank having voltmeter and ammeter for Discharging of the battery. Complete with Electronic charger to charge the batter consisting of 1 Phase / 230 V / 50 Hz. AC input, Auto cut off on 100 % Charged, LCD Display for charging voltage, current, LED array for charging status and fault condition, Microprocessor based digital circuit for charging current, protection against accidental reverse or different voltage battery connection. The rating of the charger capacity	**01**

	may be 88 Ah.	
D)	**DIGITAL MULTIMETER-HAND HELD** • 60000 count, 5-digit display, high-resolution measurements • Low-pass filter to cut high harmonics (when measuring inverter fundamental waveforms) • Terminal shutter mechanism to prevent erroneous test lead insertion • Measure up to 10A with direct input • Dual display to check voltage and frequency simultaneously • Rear kickstand • Store probes at the back of the tester • Identify excessively high input with a red screen backlight • Robust design capable of withstanding a drop from a height of 1 m **Measurements:** DC Voltage range: 60.000 mV to 1000.0 V, 6 ranges, Basic accuracy: ±0.025 % rdg. ±2 dgt. AC Voltage range: 60.000 mV to 1000.0 V, 6 ranges, Frequency characteristics: 20 Hz - 100 kHz, Basic accuracy 45 - 65 Hz: ±0.2 % rdg. ±25 dgt. (True RMS, crest factor 3) DC + AC Voltage range: 6.0000 V to 1000.0 V, 4 ranges, Frequency characteristics: 20 Hz - 100 kHz, Basic accuracy 45 - 65 Hz: ±0.3 % rdg. ±30 dgt. (True RMS, crest factor 3) Resistance range: 60.000 Ω to 600.0 MΩ, 8 ranges, (Conductance: 600.00 nS, DT4282 only), Basic accuracy: ±0.03 % rdg. ±2 dgt. DC Current range: 600.00 µA to 10.000 A, 6 ranges, Basic accuracy: ±0.05 % rdg. ±5 dgt. AC Current range: 600.00 µA to 10.000 A, 6 ranges, Basic accuracy 45 - 65 Hz: ±0.6 % rdg. ±5 dgt. (True RMS, crest factor 3), Frequency characteristics: 20 Hz - 20 kHz (at 600 µA to 600 mA range) Peak: DC V measurement: Signal width 4 msec or more (single), 1 msec or more (repeated) AC V, DC/AC A measurement: Signal width 1 msec or more (single), 250 µsec or more (repeated) Capacitance range: 1.000 nF to 100.0 mF, 9 ranges, Basic accuracy: ±1.0 % rdg. ±5 dgt. Continuity Check: Continuity threshold: 20/50/100/500 Ω, Response time: 10 ms or more Diode test: Open terminal voltage: 4.5 V or less, Testing current 1.2 mA or less, Threshold of forward voltage: 0.15 V to 3 V, seven stages Frequency range: AC V, DC+AC V, AC A measurement, at pulse width 1 µs or more (50 % duty ratio) 99.999 Hz (0.5 Hz or more) to 500.00 kHz, 5 ranges, ±0.005 % rdg. ±3 dgt. dB conversion: Standard impedance setting (dBm), 4 Ω to 1200 Ω, 20 stages Display dB conversion value of AC voltage (dBV) Temperature (thermocouples): K: -40.0 °C to 800.0 °C (-40.0 °F to 1472.0 °F) Add accuracy of the Thermocouple probe to main unit accuracy: ±0.5 % rdg. ±3°C Other functions: Filter function (remove harmonic noise, use only at 600 V AC, 1000 V AC ranges), display value hold, auto hold, MAX/MIN value display, PEAK value display, relative value display, sampling setting, internal memory (400 data), auto-power save, USB communication (option), mis-insertion prevention shutters, decibel conversion, 4-20 mA percentage conversion Display: Main and Sub displays: 5-digits LCD, max. 60000 digits Display refresh rates: 5 times/s (Capacitance measurement: 0.05 to 2 times/s, depending on measured value, Temperature: 1 time/s) Power supply:(AA) alkaline batteries ×4, Continuous use: 100 hours Accessories: Test Lead×1, Instruction Manual ×1, Alkaline Battery ×4	**01**
E)	**DIGITAL MULTIMETER-BENCHTOP** DC Voltage range: 199.999 mV to 1000.00 V, 5 ranges, Basic accuracy: ±0.01% rdg. ±2 dgt. AC Voltage range: 1999.99 mV to 750.00 V, 4 ranges, Frequency characteristics: 10 Hz to 300 kHz, Basic accuracy: ±0.1% rdg. ±100 dgt., (True RMS rectified, Crest factor addition error: 1 < C.F. ≤ 2: +200 dgt.) DC Current range: 199.999 mA/1999.99 mA, 2 ranges, Basic accuracy: ±0.1% rdg. ±6 dgt. AC Current range: 199.999 mA/1999.99 mA, 2 ranges, Frequency characteristics: 10 Hz to 30 kHz, Basic accuracy: ±0.3% rdg. ±100 dgt., (True RMS rectified, Crest factor addition error: 1 < C.F. ≤ 2: +200 dgt.) Resistance range (2-terminals): 199.999 Ω - 100.000 MΩ, 7 ranges, Basic accuracy: ±0.02% rdg. ±2 dgt. Low-power Resistance range (2-terminals): 1999.99 Ω - 1999.99 kΩ, 4 ranges, Basic accuracy: ±0.02% rdg. ±6 dgt. Resistance range (4-terminals): 199.999 Ω - 1999.99 kΩ, 5 ranges, Basic accuracy: ±0.02% rdg. ±2 dgt. Low-power Resistance range (4-terminals): 1999.99 Ω - 1999.99 kΩ, 4 ranges, Basic accuracy: ±0.02% rdg. ±6 dgt. Hz range (Frequency): 99.9999 Hz - 300.000 kHz, 5 ranges, Accuracy: ±0.015% rdg. ±2 dgt., Attenuator: 2 V to 700 V, 4 ranges (Input sensitivity: 10 % of range) Continuity test: Beep sound 50.00 Ω or less at 1999.99 Ω range, Testing current 100 µA Diode test: With 1999.99 mV range, Testing current 1 mA Other functions: Comparator, Save/Load of settings, Printer output, Current measurement with clamp-on probes and scaling, External control I/O	**01**

	Display: Digital LED, max. 199999 digits Sampling rate: 300 times/s (Fast), 8 to 9 times/s (Medium), 1 time/s (Slow)	
F)	**AC/DC CLAMP METER** DC Current range: 100.0/ 1000 A, Basic accuracy: ±1.5 % rdg. ±5 dgt. AC Current range: 100.0/ 1000 A, (10 Hz to 500 Hz, True RMS), Basic accuracy: ±1.5 % rdg. ±5 dgt. DC Voltage range: 419.9 mV to 600 V, 5 ranges, Basic accuracy: ±1.3 % rdg. ±4 dgt. AC Voltage range: 4.199 V to 600 V, 4 ranges, Basic accuracy: ±2.3 % rdg. ±8 dgt. (30 to 500 Hz, True RMS) Resistance range: 419.9 Ω to 41.99 MΩ, 6 ranges, Basic accuracy: ±2 % rdg. ±4 dgt. Crest factor: 3 or less (2 at 1000 A range, 1.5 at Voltage) Other functions: Continuity: (50 Ω ±40 Ω) or less buzzer sounds, Data hold, Auto power save, Auto zero (DC A) Display: LCD, max. 4199 dgt., Display refresh rate: 2.5 times/s Power supply: Coin type lithium battery (CR2032) ×1, Continuous use 35 hours Core jaw dia.: φ 35 mm (1.38 in) Accessories: Coin type lithium battery × 1, Carrying case ×1, Test lead ×1, Instruction manual ×1	**01**
G)	**RESISTANCE METER** Resistance range: 30 mΩ (35.000 mΩ display max., 1 μΩ resolution) to 3 MΩ range (3.5000 MΩ display max., 100 Ω resolution), 9 steps Measurement accuracy: ±0.020 % rdg. ±0.007 % f.s. Testing current: [at 30 mΩ range] 300 mA DC to [at 3 MΩ range] 500 nA DC Open-terminal voltage; 5.5 V DC max. USB: Remote function, communications monitor function, data output function Temperature measurement: -10.0°C to 99.9°C, accuracy: ±0.5°C (Temperature Sensor Z2001 and RM3544 combined accuracy) Measurement speed: FAST (50 Hz: 21 ms, 60 Hz: 18 ms) / MED (101 ms) / SLOW (401 ms) Functions: Temperature correction, comparator (ABS/REF%), key-lock (OFF, menu lock, all lock), display digit count selection function (5 digits / 4 digits), automatic power supply frequency settings (AUTO/50Hz/60Hz), scaling, judgment sound setting, auto hold, averaging, panel store/panel load Power supply: 100 to 240 V AC, 50/60 Hz, Rated power consumption: 15 VA Accessories: Power cord × 1, Clip type lead × 1, Male EXT. I/O connector × 1, Instruction manual × 1, Application disc × 1, USB cable (A-to-B type) × 1, Spare fuse × 1	**01**
H)	**EARTH TESTER** Measurement system: Two-electrode method/three-electrode method (switchable) Measurement range: 20 Ω (0 Ω～20.00 Ω), Accuracy: ±1.5% rdg ±8 dgt 200 Ω (0 Ω～200.0 Ω), Accuracy: ±1.5% rdg ±4 dgt 2000 Ω (0 Ω～2000 Ω), Accuracy: ±1.5% rdg ±4 dgt Earth voltage: 0～30.0 V rms Accuracy: ±2.3% rdg ± 8 dgt (50 Hz/60 Hz), ± 1.3% rdg ± 4 dgt (DC) Allowable earth potential: 25.0 V rms (DC or sine wave) Dustproof and waterproof: IP65/IP67 (EN60529) Power supply: Alkaline battery ×4, Possible number of measurements: 500 times Functions: Live wire warning, zero-adjustment, continuous measurement mode, wireless communication (only when Z3210 is connected), and comparator Accessories: Auxiliary Earthing Rod (2-piece set) × 1, Measurement Cable (black 4 m) × 1, Measurement Cable (yellow 10 m, equipped with winder) × 1, Measurement Cable (red 20 m, equipped with winder) × 1, Carrying Case × 1, Protector × 1, Alkaline battery × 4, Instruction manual × 1	**01**
I)	**INSULATION TESTER** Test voltage: 250 V to 5.00 kV DC, (Possible in 25 V steps between 250 V and 1 kV and in 100 V steps between 1 and 5 kV) Measurement range: 0.00 MΩ to 500 GΩ (250 V) 0.00 MΩ to 1.00 TΩ (500 V) 0.00 MΩ to 2.00 TΩ (1 kV) 0.00 MΩ to 5.00 TΩ (2.5 kV)	**01**

	0.00 MΩ to 10.0 TΩ (5 kV) Measurement current: 1 mA (Test voltage 250 V to 1.00 kV), 0.5 mA (Test voltage 1.10 kV to 2.50 kV) 0.25 mA (Test voltage 2.60 kV to 5.00 kV), Short-circuit current: 2 mA or less Resistance range: 10 MΩ to 10 TΩ, 7 ranges (auto range) Accuracy: ±5% rdg. ± 5 dgt. Up to [Test voltage (setting value)/Resistance measurable at 100 nA] ±20% rdg. ± 5 dgt. [Test voltage (setting value)/Resistance measurable at 100 nA] to [Test voltage (setting value)/Resistance measurable at 1 nA] or 500 GΩ ±30% rdg. ± 50 dgt. [Test voltage (setting value)/Resistance measurable at 1 nA] or 501 GΩ to 9.99 TΩ Leakage current measurement: 1.00 nA to 1.20 mA, 6 ranges (current measurement that occurs when test voltage is generated) Accuracy ± 2.5% rdg. ± 5 dgt. (1 mA range); refer to complete catalog for other ranges Voltage measurement: ±50 V to ± 1.00 kV DC, 50 V to 750 V AC (50/60 Hz), Accuracy: ±5 % rdg. ±5 dgt., Input resistance: Approx. 10 MΩ Temperature measurement: -10.0˚C to 70.0˚C, 3 ranges (used with optional sensor) Accuracy ±1.0˚C (0.0˚C to 40.0˚C); refer to complete catalog for other ranges Other functions: Insulation Diagnosis (Temperature compensation, PI/DAR display, Step voltage test), Data memory, Communication (USB 2.0, PC application software), auto discharge, hot conductor warning indication, etc. Display: Digital LCD, max. 999 dgt. with backlight, Bar graph display Accessories: Test leads, Alligator clips, Instruction manual, alkaline batteries, USB cable, PC application software (CD-R), AC Power Adaptor and Battery Pack.	
J)	**LCR METER** Measurement modes: LCR (Measurement with single condition), Continuous testing (Continuous measurement under saved conditions) Measurement parameters: Z, Y, θ, X, G, B, Q, Rdc (DC resistance), Rs (ESR), Rp, Ls, Lp, Cs, Cp, D (tanδ), σ, ε Measurement range: 100 mΩ to 100 MΩ, 10 ranges (All parameters are determined according to Z) Display range: Z: 0.00 m to 9.99999 GΩ, Y: 0.000 n to 9.99999 GS, θ: ± (0.000° to 180.000°), Q: ± (0.00 to 9999.99), Rdc: ± (0.00 m to 9.99999 GΩ), D: ± (0.00000 to 9.99999), Δ%: ± (0.000 % to 999.999 %), or other Basic accuracy: Z ±0.05% rdg. θ: ±0.03° (representative value, Measurable range: 1 mΩ to 200 MΩ) Measurement frequency: 4 Hz to 8 MHz (5 digits setting resolution, minimum resolution 10 mHz) Measurement signal level: [Normal mode: V mode/CV mode] 4 Hz to 1.0000 MHz: 10 mV to 5 Vrms (maximum 50 mArms) 1.0001 MHz to 8 MHz: 10 mV to 1 Vrms (maximum 10 mArms) [Low impedance high accuracy mode: V mode/CV mode] 4 Hz to 1.0000 MHz: 10 mV to 1 Vrms (maximum 100 mArms) [Normal mode: CC mode] 4 Hz to 1.0000 MHz: 10 µA to 50 mArms (maximum 5 Vrms) 1.0001 MHz to 8 MHz: 10 µA to 10 mArms (maximum 1 Vrms) [Low impedance high accuracy mode: CC mode] 4 Hz to 1.0000 MHz: 10 µA to 100 mArms (maximum 1 Vrms) [DC resistance measurement] Output impedance: Normal mode: 100 Ω Display: Color TFT with touch panel Functions: Comparator, BIN measurement (10 categories for 2 measurement parameters), Trigger function, Open/short compensation, Contact check, Panel loading/saving, Memory function.	**01**
K)	**BATTERY TESTER** Measurement Method: AC four-terminal method Measurement Frequency: 1 kHz ± 0.2 Hz Resistance measurement ranges: 3 mΩ: 3.1000 mΩ, resolution: 0.1 µΩ, measurement current: 100 mA, accuracy: ± 0.5% rdg. ± 10 dgt 30 mΩ: 31.000 mΩ, resolution: 1 µΩ, measurement current: 100 mA, accuracy: ± 0.5% rdg. ± 5 dgt 300 mΩ: 310.00 mΩ, resolution: 10 µΩ, measurement current: 10 mA, accuracy: ± 0.5% rdg. ± 5 dgt 3Ω: 3.1000 Ω, resolution: 100 µΩ, measurement current: 1 mA,	**01**

	accuracy: ± 0.5% rdg. ±5 dgt 30Ω: 31.000 Ω, resolution: 1 mΩ, measurement current: 100 μA, accuracy: ± 0.5% rdg. ± 5 dgt 300Ω: 310.00 Ω, resolution: 10 mΩ, measurement current: 10 μA, accuracy: ± 0.5% rdg. ±5 dgt 3KΩ: 3.1000 kΩ, resolution: 100 mΩ, measurement current: 10 μA, accuracy: ± 0.5% rdg. ± 5 dgt Voltage measurement ranges: 6V: 6.00000 V, resolution: 10 μV, accuracy: ±0.01% rdg. ± 3 dgt 60V: 60.0000 V, resolution: 100 μV, accuracy: ±0.01% rdg. ± 3 dgt 300V: 300.000 V, resolution: 1 mV, accuracy: ± 0.01% rdg. ± 3 dgt Response Time: 10 ms Sampling period: 4 ms, 12 ms, 35 ms, 150 ms Function: Contact Check, Zero Adjustment (±1000 counts), Pulse Measurement, Comparator, Statistical Calculation upto 30,000 (max), Delay, Average from 2 to 16 times, Panel Saving/loading, memory, LABVIEW Driver Effect of radiated radio-frequency electromagnetic field (10 V/m): Resistant Effect of conducted radiofrequency electromagnetic field 0.15 MHz to 80 MHz, 80% AM: Resistant Power supply: 100 to 240 VAC, 50 Hz, 30 VA max.	
8.	**ANALOG/DIGITAL UNIVERSAL IC TESTER** • It should test a wide range of Digital IC's such as 74 Series, 40/45 Series ICs etc. • It should test Micro- processor 8085, 8086, Z80 & Peripherals like 8255, 8279, 8253, 8259, 8251, 8155, 6264, 62256, 8288, 8284. • It should test a wide range of Analog IC's such Op-amp, 555 Timers, Transistor Arrays, Analog switches, Opto-couplers, 12bit/8bit ADC & DAC, Comparators, Waveform generator, PWM IC, Sample Hold IC, Voltage Regulator, Frequency to Voltage converter, Latch driver, VCO IC's, PLL IC's Cross Point Switch, Seven segment display of common cathode & common anode type. • Auto search facility of all Digital ICs should be available. • Test by: Truth table/sequence table comparison. • ZIF: Two numbers of 40 pin DIP ZIF sockets, Keys: 50 cherry keys Keypad with numerical & functional keys. • Supply Input Voltage: 230V (AC).	**01**
9.	**ELECTRICIAN KIT 550-WATT IMPACT DRILL KIT (77-PIECES)**	**05**
10.	**MEGGER/ INSULATION TESTER** Measurement items: Insulation resistance (Applied DC voltage method) Testing voltage: (Measurement range: AUTO/MANUAL setting is possible) 25 V ≤ V < 100 V (2.000/20.00/200.0 MΩ), 100 V ≤ V < 500 V (2.000/20.00/200.0/2000 MΩ), 500 V ≤ V ≤ 1000 V (2.000/20.00/200.0/4000 MΩ) Basic accuracy: ±2 % rdg. ± 5 dgt. 25 V ≤ V < 100 V [0 to 20 MΩ] 100 V ≤ V < 500 V [0 to 20 MΩ] 500 V ≤ V ≤ 1000 V [0 to 20 MΩ] Measurement speed: Fast: 30 ms/time, Slow: 500 ms/time (selectable) Internal memory: Saved items: rated measurement voltage, comparator upper limit /lower limit values, test mode, beep sound to distinguish the result, test time, response time, resistance range, measurement speed Memory capacity: up to 10 items (can be saved/loaded) Analog output: DC +4 V f.s. Interface: RS-232C Power supply: 100 to 240 V AC, 50 Hz, 25 VA max.	**01**
11	**DC GALVANOMETER** Measuring Range: 50 μA/5 mA Accuracy: Up to ± 3%	**03**
12	**LUX METER (DIGITAL)** Measuring Range: 0-100000 Lux or Above Accuracy: Up to ±5%	**02**

	LCD Display, Up to 2 seconds response time, with built in dry cell.	

LIST & SPECIFICATIONS FOR PLUMBING SHOP

SR. NO.	ITEM DESCRIPTION	QTY (NOS.)
1.	**FULL SCALE SEWERAGE SYSTEM** **Technical details** Pump Power consumption: up to 550 W Max. flow rate: 4.5 m^3/h Max. head: 42.6 m Collection tank Volume: approx. 300 L or more Cisterns 4 x 20 L 6 x 10 L Cistern 1 x 9 L Flush for toilet: max. 9 L Measuring ranges Flow rate: 0.4…4 L/h Pressure: 6 x 1500 mm WC 230 V, 50 Hz, 1 phase	**01 Set**
2.	**ASSEMBLY STATION PIPES, VALVES AND FITTINGS** **Technical details** Pipe network 9x tube with steel flange 9x tube with cutting ring screw fitting 5x pipe bend, 90° 6x T-piece 1x enlargement Flange fittings ▪ Non-return valve, strainer, 3-way ball valve, wedge gate valve, steam trap, sight glass, shut-off valve ▪ Grey cast iron ▪ Nominal pressure: PN16 for DN15, 25 / PN10 for DN40 Ball valve with cutting ring screw fitting ▪ Brass, nickel-plated ▪ Nominal pressure: PN25 ▪ Nominal size: G1/2” Pressure vessel ▪ Manometer: 0…4 bar ▪ Steel flange: DN15	**01 Set**
3.	**TOOLS FOR PLUMBING** **1. Plumbing Wrenches** o Fixed wrenches (standard and metric) o Pipe wrench (large and small) o Adjustable crescent wrenches o Basin wrench **2. Drain Tools** o Plunger o Hand auger (also called a plumber’s snake) o Screwdriver o Bucket, rags, and sponge **3. Tools and supports for PVC Pipes** o Hacksaw o PVC pipe cutter o Metal file and brush o PVC primer o Pipe glue	**01 Set**
4.	**CUT AWAY MODELS**	**01 Set**

	The Cut Section of following components arranged on a panel along with their respective schematic and labelling explaining the constructional and working details of the component. 1) Straightway valve 2) Corner valve 3) Angle seat valve 4) Non return valve 5) Pressure reducing valve 6) Strainer 7) Gate valve 8) Straightway plug valve 9) Three ways plug valve 10) Safety valve 11) Screwed pipe connections 12) Changeover valve 13) Non return butterfly valve 14) Strainer	

LIST & SPECIFICATIONS AUTOMOBILE SHOP

SR. NO.	ITEM DESCRIPTION	QTY (NOS.)
1.	**CUT SECTION OF SINGLE AND MULTICYLINDER ENGINE – DIESEL AND PETROL** A) Single Cylinder Four Stroke Diesel Engine with Valve Timing Attachment B) Single Cylinder Four Stroke Petrol Engine with Valve Timing Attachment C) Four Cylinder Four Stroke Diesel Engine with Valve Timing Attached D) Four/Three Cylinder Petrol Engine with Valve Timing Attachment	**01 Set**
2.	**STEERING MECHANISMS** **a) Manual Steering System** i) Rack pinion type ii) Worm roller type iii) Recalculating ball type iv) Worm sector type v) Tilt telescopic collapsible steering system **b) Power Steering System Trainer**	**01 Set**
3.	**WORKING MODELS OF DIFFERENT TYPES OF BRAKES** a) Mechanical Disc Brake b) Hydraulic Disc Brake c) Hydraulic Drum Brake • Single drum • Two drum • Four drum d) Vaccuum Assisted Hydraulic Drum Brake e) Air Brake of Truck with Motorized Air Compressor	**01 Set**
4.	**ANTI LOCK BRAKING SYSTEM (ABS TRAINER)** The trainer consists of the following parts: 1. Control Panel, 2. Break Light, 3. ECU, 4. ABS Hydraulic Activator, 5. Break Lever, 6. Pressure Gauges, 7. Common Pressure Gauge.	**01 Set**
5.	**PANEL FOR AUTOMOBILE PARTS (CUT SECTION VIEW)** Common automobile parts in cut section view showing the constructional view and internal details are arranged on a panel with the detailed labelling and description of each part. a) Self-starter b) Battery c) Distributor d) Ignition coil e) Spark plug f) Magneto g) Electrical fuel pump h) Mechanical fuel pump i) Master cylinder j) Gear lubricating pump k) Radiator l) Crank shaft m) Cam shaft with different cams n) Piston with rings o) Shock absorber p) Brake cylinder q) Speedometer	**01 Set**
6.	**CLUTCHES DEMONSTRATION PANEL** Panels showing different types of clutches a) Claw clutch	**01 Set**

	b) Conical friction clutch c) Plate clutch d) Centrifugal clutch e) Multiplate clutch f) Coil spring type clutch g) Diaphragm type clutch h) Fluid flywheel (torque converter)	
7.	**FUEL SUPPLY SYSTEMS OF AUTOMOBILE** **a) <u>Fuel supply system of petrol engine-MPFI type</u>** The parts details are as under: 1. Fuel Tank 2. Fuel Filter 3. Motorized Fuel Pump 4. Pressure Gauge 5. Fuel Rail 6. Fuel Injectors 7. ECU 8. Igniter & Ignition Coil 9. Distributor 10. Spark Plugs 11. Power Supply 12. Fuel Gauge & Control Panel **b) <u>Fuel supply system of diesel engine</u>** The parts details are as under: 1. Fuel Tank 2. Fuel Filter 3. Motorized Fuel Pump 4. Pressure Gauge 5. Fuel Rail 6. Fuel Injectors 7. ECU 8. Power Supply 9. Fuel Gauge & Control Panel	**01 Set**
8.	**FRONT AXEL ASSEMBLY WITH DIFFERENT GEARS**	**1 No.**
9.	**AUTOMATIC GEAR BOX (ACTUAL CUT SECTION)**	**1 No.**
10.	**ELECTRONIC AND COMPATIBILITY TESTERITION SYSTEM OF AN AUTOMOBILE** **Coil Ignition System of an Automobile** The open demonstration unit is complete on board with original parts, ignition switch, ignition coil, distributor, four lougs necessary connections and terminals for battery connections and power supply. **Electronic Ignition System of an Automobile** The open demonstration unit is complete on board with original parts, ignition switch, ignition coil, electronic distributor (motor driven), four plugs necessary connections and power supply.	**1 No.**