



DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY
MURTHAL, SONPAT (INDIA) 131 039
(Established by Haryana State Legislative Act 29 of 2006 &
Approved under Section 2(F) & 12(B) of U.G. Act, 1956)
Website : www.dcrustm.org

Detailed Notice Inviting Tender

E-Tender Document

Tender No. DCRUST/PUR/12/2021/

Schedule: Communication System Lab Trainers

Tender Fees: Rs. 1000/-

**STD Code (0130)
Phone No. 2484022
Fax No. (0130) 2484005 & 2484004
Website: www.dcrustm.org, www.dcrustm.org**



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Instruction to the Bidder

e-Tender is invited for purchase of below mentioned item in single stage two cover system i.e. Request for Pre-Qualification / Technical Bid (online Bid under PQQ / Technical Envelope) and Request for Financial Bid (comprising of price bid Proposal under online available Commercial Envelope):-

Sr. No	Description of work / Items	Estimated cost/Basic value (In Rs.)	EMD to be deposited by Bidder	Tender Document Fee & eService Fee (Rs.)	Start Date & Time of Bid Preparation & Submission	Expiry Date & Time of Bid of EMD Submission
1.	Communication System Lab Trainers	Rs. 2.84 lacs	@ 2% of basic value	Rs. 1000 + 1180	02.03.2021	22.03.2021 at 05:00 P.M

Under this process, the Pre-qualification/ Technical online bid Application as well as online Price Bid shall be invited at single stage under two covers i.e. PQQ/Technical & Commercial Envelope. Eligibility and qualification of the Applicant will be first examined based on the details submitted online under first cover (PQQ or Technical) with respect to eligibility and qualification criteria prescribed in this Tender document. The Price Bid under the second cover shall be opened for only those Applicants whose PQQ/ Technical Applications are responsive to eligibility and qualifications requirements as per Tender document.

1. The Bidders shall have to pay for the Tender Documents Fee, EMD Fees & e-Service Fee online by using the service of secure electronic payment gateway. The secure electronic payments gateway is an online interface between bidders and online payment authorization networks.
2. The bidders must have Net Banking account in order to pay Tender Document Fee and e-Service Fee.
3. **Payment of Tender Fee:-** The payment for the Tender Document Fee shall be made by the interested bidder online directly through Net Banking with the available Banks at e-GRAS e-Payment Gateway.
4. **Payment of e-Service Fee:-**E-Service Fee payment shall be made separately by the interested bidders/ contractors online directly through Net Banking Account.
5. **Payment of EMD:-** The payment of EMD can be made through Net Banking or RTGS/ NEFT. In this regard please refer to 'Online Payment Guideline' available at the Single e-Procurement portal of Govt. of Haryana at the link: <https://etenders.hry.nic.in>
6. Intending bidders will be mandatorily required to sign-up online (create user account) on the website <https://etenders.hry.nic.in> to be eligible to participate in the e-Tender. In case the intended bidder fails to pay EMD fee under the stipulated time frame, he/she shall not be allowed to submit his/ her bids for the respective event/ Tenders.
7. In case of payment of EMD through RTGS/ NEFT, the interested bidders must remit the funds at least T+1 working day (Transaction + One Day) in advance i.e. on or before 22.03.2021 upto 2.00 P.M; and make payment via RTGS/NEFT to the beneficiary account number specified under the online generated challan. The intended bidder/ Agency thereafter will be able to successfully verify their payment online, and submit their bids on or before the expiry date & time of the respective events/ Tenders at <https://etenders.hry.nic.in>

8. However, the details of the EMD, Tender document Fee & E – Service Fee are required to be filled/ provided at the time of online Bid Preparation.

The Bidders can submit their tender documents (Online) as per the dates mentioned in the key dates:-

Key Dates

Sr. No.	Department Stage	Bidder's Stage	Start date and time	Expiry date and time
1		Tender Document Download and Bid Preparation/Submission	02.03.2021	22.03.2021 at 05:00 P.M
2	Technical Bid Opening		24.03.2021 at 12.00 Noon	
3	Financial Bid Opening		After evaluating the Technical Bid	

Important Note:

- 1) The Applicants/bidders have to complete 'Application / Bid Preparation & Submission' stage on scheduled time as mentioned above. If any Applicant / bidder failed to complete his / her aforesaid stage in the stipulated online time schedule for this stage, his / her Application/bid status will be considered as 'Applications / bids not submitted'.
- 2) Applicant/Bidder must confirm & check his/her Application/bid status after completion of his/her all activities for e-bidding.
- 3) Applicant/Bidder can rework on his/her bids even after completion of 'Application/Bid Preparation & submission stage' (Application/Bidder Stage), subject to the condition that the rework must take place during the stipulated time frame of the Applicant/Bidder Stage.
- 4) In the first instance, the online payment details of tender document fee + e-Service and EMD & PQQ/Technical Envelope shall be opened. Henceforth financial bid quoted against each of the item by the shortlisted bidder/ Agency wherever required shall be opened online in the presence of such bidders/ Agency who either themselves or through their representatives choose to be present. The bidder can submit online their bids as per the dates mentioned in the schedule/Key Dates above.

The bids shall be submitted online in two separate envelopes:

Envelope 1: Technical Bid

The bidders shall upload the required eligibility & technical documents online in the Technical Bid.

Envelope 2: Commercial Bid

The bidders shall quote the prices in price bid format under Commercial Bid.

Chapter-I
Instructions to bidder on Electronic Tendering System

1. **These conditions will over-rule the conditions stated in the tender documents, wherever relevant and applicable.**
2. **Registration of bidders on e-Procurement Portal:-**

All the bidders intending to participate in the tenders process online are required to get registered on the centralized e - Procurement Portal i.e. www.etenders.hry.nic.in. Please visit the website for more details.

3. **Obtaining a Digital Certificate**

- i. The Bids submitted online should be encrypted and signed electronically with a Digital Certificate to establish the identity of the bidder bidding online. These Digital Certificates are issued by an Approved Certifying Authority, by the Controller of Certifying Authorities, Government of India.
- ii. Digital Certificate is issued upon receipt of mandatory identity (i.e. Applicant's PAN Card) and Address proofs and verification form duly attested by the Bank Manager / Post Master / Gazetted Officer. Only upon the receipt of the required documents, a digital certificate can be issued. For more details please visit the website – www.etenders.hry.nic.in
- iii. The bidders may obtain Class-II or III digital signature certificate from any Certifying Authority or Sub-certifying Authority authorized by the Controller of Certifying Authorities or may obtain information and application format and documents required for the issue of digital certificate from **O/o DS&D Haryana, SCO-09, 2nd floor, sector – 16, Panchkula – 134108**
- iv. The bidder must ensure that he/she comply by the online available important guidelines at the portal www.etenders.hry.nic.in for Digital Signature Certificate (DSC) including the e-Token carrying DSCs.
- v. Bid for a particular tender must be submitted online using the digital certificate (Encryption & Signing), which is used to encrypt and sign the data during the stage of bid preparation. In case, during the process of a particular tender, the user loses his digital certificate (due to virus attack, hardware problem, operating system or any other problem) he will not be able to submit the bid online. Hence, the users are advised **to keep a backup of the certificate** and also keep the copies at safe place under proper security (for its use in case of emergencies).
- vi. In case of online tendering, if the digital certificate issued to the authorized user of a firm is used for signing and submitting a bid, it will be considered equivalent to a no-objection certificate /power of attorney / lawful authorization to that User. The firm has to authorize a specific individual through an authorization certificate signed by all partners to use the digital certificate as per Indian Information Technology Act 2000. Unless the certificates are revoked, it will be assumed to represent adequate authority of the user to bid on behalf of the firm in the department tenders as per Information Technology Act 2000. The digital signature of this authorized user will be binding on the firm.
- vii. In case of any change in the authorization, it shall be the responsibility of management / partners of the firm to inform the certifying authority about the change and to obtain the digital signatures of the new person / user on behalf of the firm / company. The procedure for application of a digital certificate however will remain the same for the new user.

viii The same procedure holds true for the authorized users in a private/Public limited company.

In this case, the authorization certificate will have to be signed by the directors of the company.

3.1. **OPENING OF AN ELECTRONIC PAYMENT ACCOUNT: -**

For purchasing the tender documents online, bidders are required to pay the tender documents fees online using the electronic payments gateway service shall be integrated with the system very soon till then it will be submitted manually. For online payment guidelines, please refer to the home page of the e-tendering portal www.etenders.hry.nic.in.

3.2. **PRE-REQUISITES FOR ONLINE BIDDING:**

In order to operate on the electronic tender management system, a user's machine is required to be set up. A help file on system setup/Pre-requisite can be obtained from Nextenders (India) Pvt. Ltd. or downloaded from the home page of the website - . The link for downloading required java applet & DC setup are also available on the Home page of the e-tendering Portal.

3.3. **ONLINE VIEWING OF DETAILED NOTICE INVITING TENDERS:**

The bidders can view the detailed N.I.T and the time schedule (Key Dates) for all the tenders floated through the single portal eProcurement system on the Home Page at www.etenders.hry.nic.in

3.4. **DOWNLOAD OF TENDER DOCUMENTS:**

The tender documents can be downloaded free of cost from the eProcurement portal www.etenders.hry.nic.in

3.5. **KEY DATES:**

The bidders are strictly advised to follow dates and times as indicated in the online Notice Inviting Tenders. The date and time shall be binding on all bidders. All online activities are time tracked and the system enforces time locks that ensure that no activity or transaction can take place outside the start and end dates and the time of the stage as defined in the online Notice Inviting Tenders.

Sr. No.	Department Stage	Bidder's Stage	Start date and time	Expiry date and time
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3	Financial Bid Opening		After evaluating the Technical Bid	

3.6. ONLINE PAYMENT OF TENDER DOCUMENT FEE, E-SERVICE FEE, EMD FEES & BID PREPARATION & SUBMISSION (PQQ/ TECHNICAL & COMMERCIAL/PRICE BID):

i. ONLINE PAYMENT OF TENDER DOCUMENT FEE & E-SERVICE FEE:

The online payment for Tender document fee, eService Fee & EMD can be done using the secure electronic payment gateway. The Payment for Tender Document Fee and eService Fee shall be made by bidders/ Vendors online directly through Internet Banking Accounts. The Payment for EMD shall be made online directly through RTGS / NEFT. The secure electronic payments gateway is an online interface between contractors and online payment authorization networks.

ii. PREPARATION & SUBMISSION Of online APPLICATIONS/BIDS:

Detailed Tender documents may be downloaded from e-procurement website (www.etenders.hry.nic.in) and tender mandatorily be submitted online.

Scan copy of Documents to be submitted/uploaded for Prequalification or Technical bid under online PQQ/ Technical Envelope: The required documents (refer to DNIT) shall be prepared and scanned in different file formats (in PDF /JPEG/MS WORD format such that file size is not exceed more than 10 MB) and uploaded during the on-line submission of PQQ or Technical Envelope.

FINANCIAL or Price Bid PROPOSAL shall be submitted mandatorily online under Commercial Envelope and original not to be submitted manually)
ASSISTANCE TO THE BIDDERS:-

In case of any query regarding process of e-tenders and for undertaking training purpose, the intendedbidder can also avail the following and can contact service provider as per below:

Office Timings of Help-desk support for Single e Procurement Portal of Government of Haryana- Technical Support Assistance will be available over telephone Monday to Friday (09:00am to 5:30 pm) & Training work shop will be conducted one very 1st, 2nd Friday (from 3:30 pm upto 5:30 pm) of each month.

Important Note:-

- a) Any intending bidder can contact the helpdesk on or before prior to 4 hours of the scheduled closing date & time of respective e-Auction/Tender event.
- b) Queries ertaining to e-Payment of EMD, please contact the help desk at least 2 business days prior to the closing date & time of e-Auction/Tender event.
- c) Help-desk support will remain closed during lunch break i.e. from 1:30 PM upto 2:15 PM on each working day.

Haryana eProcurement Help Desk Office will remain closed on Saturday, Sunday and National Holidays

NOTE:- Bidders participating in online tenders shall check the validity of his/her Digital Signature Certificate before participating in the online Tenders at the portal www.etenders.hry.nic.in.

For help manual please refer to the 'Home Page' of the e-Procurement website at www.etenders.hry.nic.in.

Guideline for Online Payments in e-tendering

Post registration, bidder shall proceed for bidding by using both his digital certificates (one each for encryption and signing). Bidder shall proceed to select the tender he is interested in. On the respective Department's page in the e-tendering portal, the Bidder would have following options to make payment.

- A. Net Banking
- B. RTGS/NEFT

Operative Procedures for Bidder Payments

A) Net Banking

The procedure for paying through Net Banking will be as follows.

- i. Bidder selects Net Banking option in e-Procurement portal.
- ii. The e-Procurement portal displays the amount to be paid by bidder.
- iii. Bidder clicks on "Continue" button
- iv. The e-Procurement portal takes the bidder to Net Banking payment gateway screen displaying list of Banks
- v. Bidder chooses his / her Bank
- vi. The Net Banking gateway redirects Bidder to the Net Banking page of the selected Bank
- vii. Bidder enters his account credentials and confirms payment
- viii. The Bank verifies the credentials and confirms with "successful" or "failure" message to the Net Banking gateway which is confirmed back to e-Procurement portal.
- ix. The page is automatically routed back to e-Procurement portal
- x. The status of the payment is displayed as "successful" in e-Procurement portal.
- xi. The e-Procurement portal also generates a receipt for all successful transactions. The bidder can take a print out of the same.
- xii. The e-Procurement portal allows Bidder to process another payment attempt in case payments are not successful for previous attempt.

B) RTGS/ NEFT

The bidder shall have the option to make the EMD payment via RTGS/ NEFT. Using this module, bidder would be able to pay from their existing Bank account through RTGS/NEFT. This would offer a wide reach for more than 90,000 bank branches and would enable the bidder to make the payment from almost any bank branch across India.

- i. Bidder shall log into the client e-procurement portal using user id and password as per existing process and selects the RTGS/NEFT payment option.
- ii. Upon doing so, the e-procurement portal shall generate a pre-filled challan. The challan will have all the details that is required by the bidder to make RTGS-NEFT payment.
- iii. Each challan shall therefore include the following details that will be pre-populated:
 - Beneficiary account no: (unique alphanumeric code for e-tendering)
 - Beneficiary IFSC Code:
 - Amount:
 - Beneficiary bank branch:
 - Beneficiary name:
- iv. The Bidder shall be required to take a print of this challan and make the RTGS/NEFT on the basis of the details printed on the challan.
- v. The bidder would remit the funds at least T + 1 day (Transaction + One day) in advance to the last day and make the payment via RTGS / NEFT to the beneficiary account number as mentioned in the challan.

vi. Post making the payment, the bidder would login to the e-Tendering portal and go to the payment page. On clicking the RTGS / NEFT mode of payment, there would be a link for real time validation. On clicking the same, system would do auto validation of the payment made.

Sr. no.	Scenario	Do's / Don'ts
1	<p>In the event of making Payment through NEFT/RTGS</p>	<p>Do's</p> <ul style="list-style-type: none"> • It is the bidder's responsibility to ensure that RTGS/NEFT payments are made to the exact details as mentioned in the challan which are: <ol style="list-style-type: none"> 1) Beneficiary account no: <client code> + <random number> 2) Beneficiary IFSC Code: As prescribed by ICICI Bank (this shall remain same across all tenders) 3) Amount: As mentioned on the challan. It is specific for every tender/transaction 4) Beneficiary bank branch: ICICI Bank Ltd, CMS 5) Beneficiary name: As per the challan • For every tender, details in the challan are different and specific to that tender only. Bidder should not make use of a challan for making payment for another tenders' EMD • It is advised that all the bidders make payment via RTGS/NEFT at least one day in advance to the last day of tender submission as certain amount of time is required for settlement and various parties are involved. The payment may not be available for the bidder validation. In such cases bidder may not be able to submit the tender • Bidder has to make only single payment against a challan as per the amount mentioned on the challan. • Bidder must do the payment before tender validity gets expired

		<p>Don'ts</p> <ul style="list-style-type: none"> • Bidder should not enter erroneous details while filling the NEFT/RTGS form at their bank. The following possibilities may arise: <ol style="list-style-type: none"> 1) Incorrect IFSC code mentioned:- Transaction would be rejected and the amount would be refunded back in to the bidders account 2) Incorrect Beneficiary account number mentioned(<client code> + <random number>):- <ol style="list-style-type: none"> a) In case, the beneficiary account number mentioned is incorrect the transaction would be rejected and the bid would not be accepted. 3) Incorrect Amount mentioned: The amount would be rejected if the amount mentioned in while making the payment is incorrect. Such cases will be captured as un-reconciled transactions and will be auto-refunded directly to bidder's account. <p>In the event of any discrepancy, payment would not be considered and bidder would not be allowed to bid/ participate.</p> <ul style="list-style-type: none"> • Bidder is not supposed to use challan generated in one tender for payment against another tender since details in the challan are unique to the tender and bidder combination. • Bidder must not make multiple or split payments against a particular challan. Any split payment received against the same challan will be refunded back to the bidder. • Bidder would not be entitled to claim that he is deprived of participating in the tender because his funds are blocked with the division on account of incorrect payment made by the bidder
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E. BID OPENING AND EVALUATION

4. Bid Opening

4.1. Tender Opening & Evaluation Committee will open all the Bids received (except those received late), in the presence of the Bidders or their representatives who choose to attend at time, date and the place specified in Appendix in the manner specified in Clause 3.3. In the even of the specified date of Bid opening being declared a holiday, the Bids will be opened at the appointed time and location on the next working day.

4.2. **Deleted.**

4.3. The "Technical Bid" shall be opened first.

4.4 The amount of earnest money, forms and validity shall be announced. Thereafter, the bidders' names and such other details as the Employer may considered appropriate, will be announced by the Committee, Murthal (Sonapat) at the opening.

4.5 Evaluation of the technical bids with respect to bid security, qualification information and other information furnished shall be taken up and completed on the date of bid opening and a list will be drawn up of the responsive bids whose financial bids are eligible for consideration.

4.6 The date & time of opening of the Financial Bid will be announced by the Committee.

4.7 At the time of opening of “Financial Bid”, the names of the bidders whose bids were found responsive in accordance with Clause 3.4 will be announced. The bids of only those bidders will be opened. The responsive Bidders’ names, the Bid prices, the total amount of each bid, any discounts and such other details as the Employer may consider appropriate, will be announced by the Committee at the time of opening. Any Bid price or discount, which is not read out and recorded, will not be taken into account in Bid Evaluation.

4.8 The committee will prepare the minutes of the bid opening including the information disclosed to those present in accordance with sub clause 3.6.

5. Process to be Confidential

5.1 Information relating to the examination, clarification, evaluation, and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any efforts by a Bidder to influence the Committee processing of Bids or award decisions may result in the rejection of his Bid.

6. Clarification of Financial Bids

6.1 To assist in the examination, evaluation, and comparison of Bids, the Committee may, at his discretion, ask any Bidder for clarification of his Bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the committee in the evaluation of the Bid in accordance with Clause 7.

6.2 Subject to sub-clause 5.1, no Bidder shall contact the Employer on any matter relating to his bid from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, it should do so in writing.

6.3 Any efforts by the Bidder to influence the committee in the Employer’s bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidders’ bid.

7. Examination of Bids and Determination of Responsiveness

7.1 During the detailed evaluation of “Technical Bids”, the Committee will determine whether each Bid is substantially responsive to the requirements of the Bidding documents. During the detailed evaluation of the “Financial Bid”, the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e. priced bill of quantities, technical specifications, and drawings.

7.2 A substantially responsive “Financial Bid” is one which conforms to all the terms, conditions, and specifications of the Bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which effects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Bidding documents, the committee right or the Bidder’s obligations under the Contract; or (c) whose rectification would effect unfairly the competitive position of other Bidders presenting substantially responsive Bids.

7.3. If a “Financial Bid” is not substantially responsive, it will be rejected by the Committee and may not subsequently be made responsible by correction or withdrawal of the non-conforming deviation or reservation.

8. Correction of Errors.

8.1. “Financial Bids” determined to be substantially responsive will be checked by the Committee for any arithmetic errors. Errors will be corrected by the Employer as follows:

- (a) Where there is a discrepancy between the rates in figures and in words, the rate in words will govern; and
- (b) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

8.2. The amount stated in the “Financial Bid” will be corrected by the Employer in accordance with the above procedure and the bid amount adjusted with the concurrence of the Bidder in the following manner.

- (a) If the Bid price increases as a result of these corrections, the amount as stated in the bid will be the ‘bid price’ and the increase will be treated as rebate;
- (b) If the bid price decreases as a result of the corrections, the decreased amount will be treated as the ‘bid price’

Such adjusted bid price shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount the Bid will be rejected, and the Bid security may be forfeited.

9. Deleted

10. Evaluation and Comparison of Financial Bids.

10.1. The Committee will evaluate and compare only the Bids determined to be substantially responsive in accordance with Sub-Clause 6.2.

10.2. In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:

- (a) Making any correction for errors pursuant to Clause 7; or
- (b) Making an appropriate adjustment for any other acceptable variations. deviations; and
- (c) deleted.

10.3. The Committee reserves the right to accept or reject any variation or deviation, Variations and deviations and other factors, which are in excess of the requirements of the Bidding documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Bid evaluation.

11. Deleted

12. Award Criteria

12.1 Subject to Clause 12, the Committee will award the Tender to the Bidder whose Bid has been determined.

- (i) To be substantially responsive to the Bidding documents and who has offered the lowest evaluated Bid Price (in total of all items); and
- (ii) To be within the available bid capacity adjusted to account for his bid price (in total of all items) which is evaluated the lowest in any of the packages opened earlier than the one under consideration.

In no case, the contract shall be awarded to any bidder whose available bid capacity is less than the evaluated bid.

13. Employer's right to accept any Bid and to reject any or all Bids

13.1. Notwithstanding Clause 31, the Employer reserves the right to accept or reject any Bid, and to cancel the Bidding process and reject all Bids, at any time prior to the award of Contract, without thereby incurring any liability to the effected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer action.

13.2 Normally, the lowest responsive tender (L1) shall be accepted unless there is some valid objection like, his record of failure in execution of formal works or his rates being abnormally low and nor workable, etc

13.3 Tenders shall be accepted in accordance with the delegation of the powers under Departmental Financial Rules (DFR).

14. Notification of Award and Signing of Agreement

14.1. The Bidder whose Bid has been accepted will be awarded the purchase order prior to expiration of the Bid validity period.

14.2 If the lowest tenderer (L-1) backs out, his earnest money shall be forfeited, the agency will be de-barred for giving tenders for one year and the second lowest tenderer(L-2), third lowest tenderer (L-3) in order of sequence, may be called upon to bring his offer to the same level as the originally first lowest tenderer. In the event of their refusal to do so, tenders shall be recalled. In case of great urgency, authority competent to accept the tender may authorize call of limited or short notice tenders.

15. Performance Security

15.1. The successful Bidder shall provide the Performance Security @ 2% in any of the forms bank guarantee/Demand Draft in favour of Registrar for the warranty/guarantee period of the equipment/instruments etc

15.2 The performance security will be returned/refunded after the expiration of satisfactory warranty period.

15.3 In case, the supplier/contractor fails to execute the supply order/contract on the rates, and terms and conditions as contained in the supply order within the stipulated period, they shall be liable to such action as blacklisting, debarring from having any business with this University, forfeiture of Earnest Money/Security, besides any other action as may be deemed proper by the University.

16. Corrupt or Fraudulent Practices

The Committee will reject a bid if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question and will declare the firm ineligible, either indefinitely or for a stated period of time.

Chapter-II

Scope of work

Online tenders are invited from reputed manufacturers/suppliers for the supply of items as per quantity given in bracket required for .ECE...Dept. in this University.

TECHNICAL SPECIFICATIONS OF ITEMS FOR THE SETUP OF Communication Lab equipment

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Sr. No	Sr. No. as per T----- file	Name of experiment	Items with specification	No of set required
1		<u>Amplitude Modulation (SSB/DSB) Transmitter & Receiver Trainer</u>	<p><u>Amplitude Modulation (SSB/DSB) Transmitter & Receiver Trainer</u></p> <p>Transmitter : On board Functional blocks with self explanatory waveforms and technical details indicated .Oscillator controlled carrier frequency ;LED indication for signal flow and selection. At least 25 nos. test points for waveform observation</p> <p>At least 8 Switched faults for troubleshooting at different functional blocks</p> <p>Telescopic antenna should be provided for transmission of AM signal</p> <p>On board audio jacks should be provided for Microphone and Earphone connection. On board Speaker provided for audio communication</p> <p>Audio Oscillator : Adjustable Amplitude & Frequency (300 Hz - 3.4 KHz)</p> <p>Audio Output : Amplifier with speaker</p> <p>Modulators : Balanced Modulator with Band pass Filter (1 MHz) - 2 nos.</p> <p>Balanced Modulator : 1 No. (455 KHz) ;</p> <p>Ceramic Band pass Filter : 1 No. (455 KHz)</p> <p>Carrier Frequency : 1 MHz (Oscillator controlled)</p> <p>Transmitter Amplifier Output: (Gain adjustable) DSB (1 MHz),</p> <p>SSB (1.445 MHz) connected to Antenna/cable</p> <p>Antenna: Telescopic with Radiation distance up to approx. 1 meters</p> <p>Switched Faults : 8 nos.; Test points: 27 nos</p> <p><u>Receiver</u></p> <p>On board Functional blocks with self explanatory waveforms and technical details indicated. On board Tuner provided for tuning the transmitting station,LED indication for signal flow and selection</p> <p>At least 30 nos. test points for waveform</p>	02

			<p>observation and analysis 8 Switched faults for troubleshooting at different functional blocks Telescopic antenna for reception of AM signal On board audio jack provided for Earphone connection On board Speaker provided for audio communication Construction : Superhetrodyne Frequency Range :980 to 2060 KHz Intermediate Frequency :455KHz ;Input Circuit:1. RF amplifier 2. Mixer 3. Local oscillator 980 to 2060 KHz 4. Beat Freq. Oscillator 5. IF Amplifier 6. IF Amplifier 2 ,Tuning :Variable capacitor(Ganged) Dial marking on board : Range 525 to 1600 KHz ,Receiving Media :Telescopic Antenna/ Cable Detectors :1). Diode Detector (DSB) 2.) Product Detector (SSB) Audio Output :Amplifier With Speaker/ Headphone ,Switch able Automatic Gain Control ,Switched Faults:8 Nos. ; Test points: 30 nos</p>	
2		<u>FM Modulation & demodulation Module</u>	<p><u>FM Modulation & demodulation Module</u> on board Functional blocks with self explanatory waveforms and technical details ,On board Audio Oscillator, Frequency modulators/demodulators, Mixer/Amplifier, Amplitude limiter & Filter circuits Effect of noise on the detection of FM signal may be investigated LED indication for signal flow and selection 40 nos. Test points for waveform observation and analysis 12 Switched faults for troubleshooting at different functional blocks Audio Oscillator : Sine wave (10Vpp adjustable) Frequency (300 Hz - 3.4 KHz),FM Modulators : 3 nos. Reactance Modulator : Carrier Frequency 455 KHz (± 3KHz) Varactor Modulator : Carrier Frequency 455 KHz (± 2KHz) VCO Based Modulator(IC XR2206 based) : Carrier Frequency 10 KHz - 200KHz (adjustable),Mixer / Amplifier : Allows FM input signal to be amplitude modulated by a noise,input prior to demodulation, with gain adjustment.,FM Demodulator : 6 nos. Detuned Resonant Detector ;Quadrature Detector Foster-Seeley Detector ; Ratio Detector Phase-Locked Loop Detector (IC HEF4046 based),Phase-Locked Loop Detector (IC LM565 based),Low Pass Filter : 3.4 KHz Cut off Frequency Amplifier (with adjustable gain) Amplitude Limiter : 1 no. ; Switched Faults : 12 nos.; Test Points : 40 nos</p>	02

3		<u>PAM/PPM/PWM Modulation & Demodulation Techniques Training Kit</u>	<u>PAM/PPM/PWM Modulation & Demodulation Techniques Training Kit</u> Modulator and Demodulator on same board Different type of sampling, Natural, Flat top, sampled and hold On-board DDS Signal Generator for standard and arbitrary signals Selectable sampling frequencies for PAM & Ramp frequencies for PWM and PPM On board 2nd order Butterworth low pass filter SMD LED Indicators Modulation & Demodulation Techniques : PAM ,PWM & PPM , Line Coding Techniques Internal Signal Generator : Direct Digital Synthesizer Types of Signal : Sine, Square, Triangle, Arbitrary signals. Frequency : 500Hz, 1KHz, 2KHz, 3KHz External Signal :Types of Signal : Sine, Square, Triangle, Arbitrary signals Maximum Input Voltage : 3Vpp (Max.) +1.5V DC offset; Frequency : 500Hz to 3.5KHz Sampling/Ramp Frequencies : 1.25KHz, 2.50KHz, 5KHz, 9.80KHz, 19.53KHz, 39.06KHz, 78.13KHz Crystal Frequency : 20MHz ; Selection Mode : Push switches Random Data (For line Coding) : 8 Bit/ 16 Bit/ 32 Bit Data Frequency : 500Hz, 1KHz, 2KHz, 3KHz ; Low Pass Filter : Cut-off frequency-5KHz Test Points : 29 nos SMD LED Indicators : 46 nos for DDS signal selection , DDS signal frequency selection Sampling selection , Technique Selection , Interconnect path Power Supply : 110V - 260V AC, 50Hz	02
4		<u>TDM Pulse Code Modulation & demodulation Module</u>	<u>TDM Pulse Code Modulation & demodulation Module</u> Modulation/Transmitter Crystal Frequency : 16 MHz On Board Analog Signal : 2 KHz, 4 KHz (Sine wave synchronized to sampling pulse Adjustable amplitude and separate variable DC level) Input Channels : 2 nos.; Multiplexing : Time Division Multiplexing Modulation : Pulse Code Modulation ; Sync Signal : Pseudo Random Sync Code Generator Error Check Code : Off - Odd - Even - Hamming Operating Mode : Fast : 320 KHz / channel approximately Slow : 1.9 Hz / channel approximately ; Test Points : 50 nos ; Demodulation/receiver Input Channel : Time Division Multiplexed serial Input Demodulation : Pulse Code Demodulation Clock Regeneration : By Phase Locked loop	02

			<p>Error Detection (Single bit) : Off-Odd- Even parity & Hamming code Error Correction : Hamming code ; Test Points : 50 nos. Transmitter & receiver Should have Fast & Slow mode of operation to observe data flow. Operating Speeds : Fast - 320 KHz/Channel, Slow 1.9Hz / Channel</p>	
5		<p><u>Data Formatting and Carrier Modulation</u> <u>ASK, FSK, PSK, DPSK, QPSK</u> <u>/Transmitter Trainer & Demodulation Receiver Trainer</u></p>	<p><u>Data Formatting and Carrier Modulation</u> <u>ASK, FSK, PSK, DPSK, QPSK</u> <u>/Transmitter Trainer & Demodulation Receiver Trainer</u> On-board Unipolar to Bipolar conversion.& data inverter. On-board 8-bit Data Source & Clock Source Crystal Frequency : 4.096 MHz Data formats : NRZ (L), NRZ (M), RZ, AMI, RB, Biphase(Manchester), Biphase (Mark). Carrier modulation : ASK, FSK, PSK, DPSK, QPSK On-board carrier : Sine waves synchronized to transmitted data at 1.6 MHz, 960 KHz, (0 deg. phase) 960 KHz, (90 deg. phase) Test Points : At least 43 Nos <u>Data Reformatting and Carrier Demodulation Receiver Module</u> On - Board Biphase Clock recovery , data squaring & Differential decoder circuit. On - Board 4th Order Butterworth filters & 8 bit Data Receiver Input : From Data Formatting and Carrier Modulation/Transmitter Trainer Data formats: 7 different data reconditioning formats NRZ (M), NRZ(L) ,RZ, AMI, RB, Biphase (Manchester), Biphase (Mark). Carrier Demodulation : ASK - Diode detector ,FSK PLL Detector PSK /DPSK- Square Loop Detector QPSK -Fourth Power Loop Detector Biphase Clock Recovery : By PLL Test points: At least 39 Nos</p>	02

The detailed specifications & Tender Document can be downloaded from the University website www.dcrustm.org. Earnest Money@ 2% of the basic price will have to be submitted along with tender document fee and e-service fee. The tenders complete in all respect must submit online on or before **22.03.2021 by 05:00 P.M.** The Tender receipt after due date, without Earnest Money, e-tendering process fee will not be accepted. The tenders will be opened on **24.03.2021 at 12:00 Noon** in the Committee Room in Admin. Block. The tenderer/their representative may remain present at the time of opening of tenders at their own cost.

REGISTRAR

Chapter-III

Eligibility Criteria

Technical Bid

The bidding is open to all qualified bidders who fully meet the following qualifying requirements as stated:

1. Online payment of tender document fee + e-Service and EMD.
2. Bidder should attach certified copy of the registration of the firm
3. Bidder will submit copy of PAN, GST Registration Number, as applicable.
4. Bidder will submit copy of return for last month/quarter as the case may be submitted towards GST if applicable.
5. Bidder should have a minimum turnover of Rs. 50 lacs (Rupees Fifty Lacs) in any of last three financial years 2016-17, 2017-18 and 2018-19 and attach proof.
6. Bidder will submit copies of Income Tax Returns for the last three years filled by Agency.
7. Bidder will submit an undertaking that the firm has not been debarred/ blacklisted for any reason/ period by DGS&D, DS&D (Haryana) or any other Central/ State Govt. Dept./ University/ PSU etc. If so, particulars of the same may be furnished. Concealment of facts shall not only lead to cancellation of the supply order, but may also warrant legal action.
8. The bidder must have a proven track record of supplying Equipments/Trainer Kits/chemical/glassware/furniture etc to various institution of repute. The supplier should attach the certified copy of last 03 years supply order for the supply of the same.
9. Bidder should certify that the item has not been supplied at the rate lower than the quoted in any other government organization. In case the certificate is found incorrect at a later stages, recovery of difference will be payable by the L-1.
10. Undertaking to the effect that a security deposit of 2% of order value will be submitted in case University decides to place the purchase order.
11. Bidder will submit the authorization certificate for supply of equipments/chemical/Glassware/Plasticware/furniture items etc.
12. Other document necessary in support of eligibility criteria, product catalogue, Technical specification prescribed and Technical specification offered, brochure etc as per.

Opening and Evaluation Offers

Part-I:

- i. On line Technical part of bid will be opened on dated **24.03.2021 at 12.00 noon in the office Committee Room, Adjacent to office of the Controller of Finance, DCRUST, Murthal (Haryana)** in the presence of tenderers or their authorised representative who wish to attend the meeting.
- ii. University, if required, may at its discretion obtain clarifications on offer by requesting such clarifications from any or all the tenderers. Such requests for clarification and the response shall be in writing.

Part-II:

Price part of only those tenderers, whose offers are found technically and commercially acceptable after evaluation as per **technical bid** of the Techno-Commercial part will be opened.

- I. University, if required, may at its discretion extend the schedule date of opening of the tender.
- II. The technical evaluation committee may take any decision deemed to be fit about the specifications, make/brand of item (s) at the time of evaluation of the bids.
- III. Price shall remain firm and fixed. Price variation clause is not acceptable.
- IV. Any conditional discount on the price offered will not be entertained/ considered.
- V. Bidders are advised to clearly mention applicable VAT/GST on the quoted items in the price part of the bid.

Chapter-IV

General Terms & conditions:

1. Online tenders, complete in all respects, must be submitted online on or before **22.03.2021 at 05:00 P.M. The tenders shall be opened on 24.03.2021 at 12:00 Noon.** The tenderer or their authorized representatives are allowed to attend the meeting of the Tender/Quotation Opening Committee at their own costs.
2. The following charges and terms may be spelt out in your offer clearly:
 - i. F.O.R
 - ii. Rates of VAT/Excise Duty (in percent), if any. Please note that the University does not issue Form 'C' or 'D'
 - iii. Payment terms.
 - iv. Delivery Period.
 - v. Guarantee/Warranty Period.
 - vi. After-sales service.
 - vii. Installation charges, if any.
 - viii. Validity period of the quotation.
 - ix. Bank Draft charges, if any.
 - x. Misc. charges such as Packing & Forwarding charges, Insurance charges, etc. if any.
3. The packing, forwarding, freight, insurance charges etc. may be quantified in terms of amount. These charges will not be payable against such vague statement as "packing, forwarding, freight and insurance charges etc. extra".
4. Charges not mentioned in the quotation/tender shall not be paid.
5. FOR shall be Deenbandhu Chhotu Ram University of Science & Technology, Murthal, Sonapat (Haryana) or Offices situated at Outstations as the case may be. The rates quoted Ex-Godown can be rejected.
6. The offer must be valid for a period of atleast three months from the date of opening of quotation/tender.
7. Quantity may increase or decrease without any notice.
8. If the Supplier or their Principals are on rate contract with DGS&D or DS&D (Haryana), this may be mentioned specifically in the offer and a photocopy of the same, duly attested, may be appended.
9. The university is situated within the Municipal Limits. As such, Octroi, if any, shall be payable. In case, the material is supplied through a Transport Company by road, the Transport Company's charges, labour charges and octroi charges shall be borne by the supplier. It may be mentioned specifically as to whether the material will be sent by rail or by road through a Transport Company.
10. The goods shall be supplied by the Supplier within the time limit specified in the supply order. The delivery period can be extended by the Deputy Registrar (Purchase & Store) with the approval of Competent Authority; only in exceptional cases on written request of the Supplier giving reasons/explaining circumstances due to which delivery period could not be adhered to. **In case, the material is not supplied within the delivery period, the supplier shall be liable to pay the University the compensation amount equivalent to 1% (one percent) of the cost of material each day or such other amount as the CPC/Deputy Registrar (Purchase & Store) may decide till the supply remains incomplete, provided that the total amount of compensation shall not exceed 10% (ten percent) of the total amount of the cost of material supplied.** Appeal against these orders shall, however, lie with the Vice Chancellor, Deenbandhu

Chhotu Ram University of Science & Technology, Murthal, Sonapat (Haryana) whose decision shall be final.

11. In case, the supplier/contractor fails to execute the supply order/contract on the rates, and terms and conditions as contained in the supply order within the stipulated period, they shall be liable to such action as blacklisting, debarring from having any business with this University, forfeiture of Earnest Money/Security, besides any other action as may be deemed proper by the University.
12. As a general policy, the University tries **to make 100% payment within 30 days** of the receipt of material subject to proper installation, wherever applicable, and satisfaction of the Inspection Committee. No advance payment or payment against documents negotiated through Bank shall be made.
13. The acceptance of the material shall be subject to satisfactory report of this Office's Inspection Committee/Technical Committee/Experts Committee.
14. The samples of the material, if necessary and possible, shall be supplied with the quotation. The unapproved samples shall be collected on receipt of information failing which the same shall be despatched by Goods Carrier on your risk with the condition of "**Freight To Pay**". Samples costing less than Rs.100-00 shall not be returned to the **quotees**. However, if the **quotees** wish to take the same back, it can be collected at their own cost within a period of one month, failing which the samples will be disposed off.
15. The acceptance of the quotation/tender shall rest with the undersigned who does not bind himself to accept the lowest quotation and reserves the right to reject any or all items of quotation/tender without assigning any reason therefore. The undersigned also reserves the right to accept quotation/tender in part i.e. any item or any quantity and to reject it for the rest.
16. The University is registered with the Department of Scientific & Industrial Research, Ministry of Science & Technology, New Delhi in terms of Govt. Notification No. 10/97- Central Excise dated 1 March, 1997 and Notification No. 51/96- Customs dated 23-07-1996 vide Registration No. **TU/V/RG-CDE(1042)/2017** dated **15.03.2018** upto **31-08-2022**. Thus the University is exempted from payment of Custom Duty and Excise Duty. The consignee shall issue necessary certificates duly countersigned by the Registrar, Deenbandhu Chhotu Ram University of Science & Technology, Murthal, Sonapat (Haryana) to avail of exemption.
17. It may be certified that you have not been debarred/blacklisted for any reason/period by DGS&D, DS&D (Haryana) or any other Central/State Govt. Department/University/PSU etc. if so, particulars of the same may be furnished. Concealment of facts shall not only lead to cancellation of the supply order, but may also warrant legal action.
18. The University has reserve a right to cancel or postpone the tender without any reason.
19. In case, any other information/clarification is required, the tenderer can be contacted to the undersigned at Telephone Nos. **0130-2484005 and 0130-2484022** on any working day (Monday to Friday) during office hour (09:00 AM to 05.00 PM).
20. The disputes, if any, shall be subject to jurisdiction of Sonapat Court. Any other jurisdiction mentioned in your quotation or invoice shall be invalid and shall have no legal sanctity.
21. The committee may proceed for negotiation at any stage.

Special Terms and Conditions

1. If the equipment is not manufactured by the bidder, authorization of the manufacturer to the bidder for marketing and servicing of the equipment in India should be enclosed along with technical bid of the tender.

2. The detailed literature/catalogue of the quoted instrument and accessories should be attached with the tender. The specifications claimed by the firm should be clearly mentioned in the literature/catalogue
3. The firm should agree to supply the spare parts/software, etc. for at least five years.
4. Please quote the AMC/CMC rate for at least four years after warranty period.
5. Free up-gradation of software for at least for four years after warranty period.
6. The instruments and accessories will be installed completely in, Department of ECE by the successful bidder. No wires, cables, etc. will be provided by ECE department for installation. It is also necessary to provide training for lab./technical personnel including trouble shooting etc. and also presentation and demonstration to research scholars, teachers and technician/lab. Attendant on instruments.
7. In case of short supply or wrong supply of equipment, its parts or accessories or supply of items in damaged conditions, it is the responsibility of the bidder to arrange for the supply of the required items in working condition as per the purchase order, within the period specified for instrument. Any additional expenditure, whatsoever, for the above will be borne by the bidder only.
8. Payment: In case of imported items, option of payment through L.C. or thorough draft or as decided by the university.

Terms and conditions printed on Quotation/Invoice of the firm, if any; shall not be binding on the University, except those mentioned specifically on the supply order, and your acceptance of the order shall be construed as your agreement to all the terms and conditions contained in the order.

Note: Successful Tenderers have to submit 2% performance security of the items/supply order, which will be refundable after satisfactory performance during the guaranty/warranty period.

REGISTRAR



**DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY,
MURTHAL (SONIPAT)**

DETAILED NOTICE INVITING TENDERS FOR SCHEDULE- Communication system Lab Trainers

Sr. No	Name of experiment	Items with specification	Quantity Required	Amount/Rate Per unit i/c GST	Warranty/ Guarantee (in years)
1	<p><u>Amplitude Modulation (SSB/DSB) Transmitter & Receiver Trainer</u></p>	<p><u>Amplitude Modulation (SSB/DSB) Transmitter & Receiver Trainer</u> Transmitter : On board Functional blocks with self explanatory waveforms and technical details indicated .Oscillator controlled carrier frequency ;LED indication for signal flow and selection. At least 25 nos. test points for waveform observation At least 8 Switched faults for troubleshooting at different functional blocks Telescopic antenna should be provided for transmission of AM signal On board audio jacks should be provided for Microphone and Earphone connection. On board Speaker provided for audio communication Audio Oscillator : Adjustable Amplitude & Frequency (300 Hz - 3.4 KHz) Audio Output : Amplifier with speaker Modulators : Balanced Modulator with Band pass Filter (1 MHz) - 2 nos. Balanced Modulator : 1 No. (455 KHz) ; Ceramic Band pass Filter : 1 No. (455 KHz) Carrier Frequency : 1 MHz (Oscillator controlled) Transmitter Amplifier Output: (Gain adjustable) DSB (1 MHz), SSB (1.445 MHz) connected to Antenna/cable Antenna: Telescopic with Radiation distance up to approx. 1 meters Switched Faults : 8 nos.; Test points: 27 nos <u>Receiver</u> On board Functional blocks with self explanatory waveforms and technical details indicated. On</p>	02		

		<p>board Tuner provided for tuning the transmitting station, LED indication for signal flow and selection</p> <p>At least 30 nos. test points for waveform observation and analysis</p> <p>8 Switched faults for troubleshooting at different functional blocks</p> <p>Telescopic antenna for reception of AM signal</p> <p>On board audio jack provided for Earphone connection</p> <p>On board Speaker provided for audio communication</p> <p>Construction : Superhetrodyne</p> <p>Frequency Range :980 to 2060 KHz</p> <p>Intermediate</p> <p>Frequency :455KHz ;Input</p> <p>Circuit:1. RF amplifier 2. Mixer</p> <p>3. Local oscillator 980 to 2060 KHz 4. Beat Freq. Oscillator 5. IF Amplifier 6. IF Amplifier</p> <p>2 ,Tuning :Variable capacitor(Ganged) Dial marking on board : Range 525 to 1600 KHz ,Receiving</p> <p>Media :Telescopic Antenna/ Cable Detectors :1). Diode Detector (DSB) 2.) Product Detector (SSB)</p> <p>Audio Output :Amplifier With Speaker/ Headphone ,Switch able Automatic Gain</p> <p>Control ,Switched Faults:8 Nos. ; Test points: 30 nos</p>			
2	<u>FM Modulation & demodulation Module</u>	<p><u>FM Modulation & demodulation Module</u></p> <p>on board Functional blocks with self explanatory waveforms and technical details ,On board Audio Oscillator, Frequency modulators/demodulators, Mixer/Amplifier, Amplitude limiter & Filter circuits</p> <p>Effect of noise on the detection of FM signal may be investigated</p> <p>LED indication for signal flow and selection</p> <p>40 nos. Test points for waveform observation and analysis</p> <p>12 Switched faults for troubleshooting at different functional blocks</p> <p>Audio Oscillator : Sine wave (10Vpp adjustable) Frequency</p>	02		

		<p>(300 Hz - 3.4 KHz),FM Modulators : 3 nos. Reactance Modulator : Carrier Frequency 455 KHz (± 3KHz) Varactor Modulator : Carrier Frequency 455 KHz (± 2KHz) VCO Based Modulator(IC XR2206 based) : Carrier Frequency 10 KHz - 200KHz (adjustable),Mixer / Amplifier : Allows FM input signal to be amplitude modulated by a noise,input prior to demodulation, with gain adjustment.,FM Demodulator : 6 nos. Detuned Resonant Detector ;Quadrature Detector Foster-Seeley Detector ; Ratio Detector Phase-Locked Loop Detector (IC HEF4046 based),Phase-Locked Loop Detector (IC LM565 based),Low Pass Filter : 3.4 KHz Cut off Frequency Amplifier (with adjustable gain) Amplitude Limiter : 1 no. ; Switched Faults : 12 nos.; Test Points : 40 nos</p>			
3	<p><u>PAM/PPM/PWM Modulation & Demodulation Techniques Training Kit</u></p>	<p><u>PAM/PPM/PWM Modulation & Demodulation Techniques Training Kit</u> Modulator and Demodulator on same board Different type of sampling, Natural, Flat top, sampled and hold On-board DDS Signal Generator for standard and arbitrary signals Selectable sampling frequencies for PAM & Ramp frequencies for PWM and PPM On board 2nd order Butterworth low pass filter SMD LED Indicators Modulation & Demodulation Techniques : PAM ,PWM & PPM , Line Coding Techniques Internal Signal Generator : Direct Digital Synthesizer Types of Signal : Sine, Square, Triangle, Arbitrary signals. Frequency : 500Hz, 1KHz, 2KHz, 3KHz External Signal :Types of Signal : Sine, Square, Triangle, Arbitrary signals Maximum Input Voltage : 3Vpp (Max.) +1.5V DC offset; Frequency : 500Hz to 3.5KHz</p>	02		

		<p>Sampling/Ramp Frequencies : 1.25KHz, 2.50KHz, 5KHz, 9.80KHz, 19.53KHz, 39.06KHz, 78.13KHz Crystal Frequency : 20MHz ; Selection Mode : Push switches Random Data (For line Coding) : 8 Bit/ 16 Bit/ 32 Bit Data Frequency : 500Hz, 1KHz, 2KHz, 3KHz ; Low Pass Filter : Cut-off frequency-5KHz Test Points : 29 nos SMD LED Indicators : 46 nos for DDS signal selection , DDS signal frequency selection Sampling selection , Technique Selection , Interconnect path Power Supply : 110V - 260V AC, 50Hz</p>			
4	<u>TDM Pulse Code Modulation & demodulation Module</u>	<p><u>TDM Pulse Code Modulation & demodulation Module</u> Modulation/Transmitter Crystal Frequency : 16 MHz On Board Analog Signal : 2 KHz, 4 KHz (Sine wave synchronized to sampling pulse Adjustable amplitude and separate variable DC level) Input Channels : 2 nos. ; Multiplexing : Time Division Multiplexing Modulation : Pulse Code Modulation ; Sync Signal : Pseudo Random Sync Code Generator Error Check Code : Off - Odd - Even - Hamming Operating Mode : Fast : 320 KHz / channel approximately Slow : 1.9 Hz / channel approximately ; Test Points : 50 nos ; Demodulation/receiver Input Channel : Time Division Multiplexed serial Input Demodulation : Pulse Code Demodulation Clock Regeneration : By Phase Locked loop Error Detection (Single bit) : Off- Odd- Even parity & Hamming code Error Correction : Hamming code ; Test Points : 50 nos. Transmitter & receiver Should have Fast & Slow mode of operation to observe data flow. Operating Speeds : Fast - 320</p>	02		

		KHz/Channel, Slow 1.9Hz / Channel			
5	<u>Data Formatting and Carrier ModulationASK, FSK, PSK, DPSK, QPSK /Transmitter Trainer & Demodulation Receiver Trainer</u>	<u>Data Formatting and Carrier ModulationASK, FSK, PSK, DPSK, QPSK /Transmitter Trainer & Demodulation Receiver Trainer</u> On-board Unipolar to Bipolar conversion.& data inverter. On-board 8-bit Data Source & Clock Source Crystal Frequency : 4.096 MHz Data formats : NRZ (L), NRZ (M), RZ, AMI, RB, Biphase(Manchester), Biphase (Mark). Carrier modulation : ASK, FSK, PSK, DPSK, QPSK On-board carrier : Sine waves synchronized to transmitted data at 1.6 MHz, 960 KHz, (0 deg. phase) 960 KHz, (90 deg. phase) Test Points : At least 43 Nos <u>Data Reformatting and Carrier Demodulation Receiver Module</u> On - Board Biphase Clock recovery , data squaring & Differential decoder circuit. On - Board 4th Order Butterworth filters & 8 bit Data Receiver Input : From Data Formatting and Carrier Modulation/Transmitter Trainer Data formats: 7 different data reconditioning formats NRZ (M), NRZ(L) ,RZ, AMI, RB, Biphase (Manchester), Biphase (Mark). Carrier Demodulation : ASK - Diode detector ,FSK PLL Detector PSK /DPSK- Square Loop Detector QPSK -Fourth Power Loop Detector Biphase Clock Recovery : By PLL Test points: At least 39 Nos	02		