IIIT BANGALORE

No: MIIT/49/18   Date: 20th February 2018

<u>**Amendement-I**</u>

Subject: Supply, Installation, testing & commissioning and on-site support for setting up Control Systems Laboratory

IIIT Bangalore on be-half of Ministry of External Affairs (MEA) invited sealed tenders for Supply, installation, testing & commissioning and on-site support for setting up of Control Systems Laboratory for Myanmar Institute of Information and Technology (MIIT) at Mandalay in Myanmar on turnkey basis vide IIIT-B MIIT/43/18 dated 1st February 2018.

2. The following amendments are made in the above mentioned tender document

Name of Work	*EMD*	*Last date bid submission*	*Date opening of bids*
Supply, Installation, testing & commissioning and on-site support of Control Systems Laboratory.	**Rs 12.20 Lac**	**7th March 2018 at 1300 hours**	**7th March 2018 at 1500 hours**

3. The clarifications/responses to the queries listed in the pre-bid meeting are mentioned Annexure I of this amendment.

4. All other terms and conditions remain same.

Registrar IIIT-Bangalore

Annexure I

International Institute of Information Technology
(MIIT Mentoring Cell)

Tender Reference:- MIIT/43/18 for supply, installation, testing & commissioning and onsite support for installation and setting up of Control Systems Laboratory for Myanmar Institute of Information and Technology (MIIT) at Mandalay in Myanmar on turnkey basis.

Following clarifications are issued in response to the queries received from Prospective bidders:

Sl no	Tender Technical Queries	Clause as published in the tender	Remarks/sub mission/Justifi cation	Clarifications/Corrigend a/Amendment
01	Section 1 Clause No 2.d	Self-Attested copy of VAT/ CST, Service Tax Number/ Registration certificate, GST as applicable.	Please delete VAT / CST No & Service Tax Number as GST is now in place	The change is accepted
02	Section 1 Clause No 2.g	Relevant ISO certificate in Laboratory Infrastructure.	Please allow Relevant ISO Certificate in Laboratory / Communication / IT Infrastructure.	The change is not accepted.
03	Section 1 Clause No 2.i	The copy of Supply Orders/ Contracts/ Agreements issued by/ signed with Government of India (Ministry/ Department/ Undertaking/ PSU/ Educational Institutions such as IIT's, NIT's, or other such Central Universities/Banking sector/IT-SEZs/Technology parks/ Stock/Commodity exchanges and reputed private organizations including educational institutions in India) for similar work, executed by the bidders in last five years ending December 31st 2017. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should have completed at least ONE similar work not less than	Please allow – the similar work should mean setup of any Scientific / Forensic / Secured Messaging / TV Studio Lab / IT lab instead of lab with similar items since the items desired are from IT/ICT field of communications. This will help in bringing more bidders participation.	The tender conditions, ask for experience in similar work undertaken by the bidder. Hence scientific laboratories is also part of the similar work already outlined in the tender terms and conditions.

		Rs. 4.88 Crore OR TWO similar works not less than Rs. 3.05 Crore each OR THREE similar works not less than 2.44 Crore each. The similar work means supply & installation of all/ most of the items mentioned in this tender document in a single project on turn-key basis in India/abroad.		
04	Section 3 Clause No 7	Payments: i. IIIT Bangalore shall release 5% of the payment upon purchase order subject to receipt of the performance bank guarantee as outlined in clause 8 below. ii. IIIT Bangalore shall release 35% of the payment upon dispatch of the tendered items subject to submission of original shipping documents and BL. iii. IIIT Bangalore shall release 30% of the payment upon delivery of the tendered items at MIIT subject to satisfactory certificate of receipt by Embassy of India, Yangon and/or MIIT/IIITBangalore. iv. Payment of 30% of the purchase order value will be made after physical verification by a Project Monitoring Committee (PMC). v. In case of foreign bidders who quoted in US $, letter of credit(LC) will be opened and payment would be released as per 7(1), 7(2), 7(3) and 7(4).	Payment Terms: Please allow 70% payment on dispatch against submission of Original Invoice, Packing List, Copy of Bill of Lading / AWB & Copy of Insurance & Balance 30% against Installation, testing, Commissioning duly signed by Embassy of India and /or MIIT/IIIT-Bangalore.	The current payment terms are already in effect for the other tenders being administered for this project. **The change is not accepted.**
05	Section 3 Clause No 6	Warranty: All the items covered in the schedule of requirements, shall carry minimum 2 (two) years on site comprehensive warranty from the date of its installation & commissioning. The bidder must undertake to provide the installation and warranty service in Myanmar. The repairing/	Please clarify Warranty required is 2 year or 1 year as per MAF Format on page no 23	The warranty required is for 2 years as already outlined in the document

		rectification/ replacement/ configuration required, if any, must be done at site only. During the warranty, all Tender Document for Supply, Installation, Testing, Commissioning(SITC) and onsite support for Control Systems Laboratory of MlIT Project, Mandalay, Myanmar 12 of 27 complaints should be rectified within 7 days from the time of complaint. In case the rectification of fault involves replacement of some hardware the same should be carried out within 21 days form the date of intimation. Failure to do so would result in the invoking of the PBG. The PBG will be released by IIIT Bangalore only after the submission of satisfactory performance certificate issued by MIIT / Indian Mission & end-user after the completion of warranty period. The Purchaser reserves the right to reject any set of equipment found defective within 30 days after the date of acceptance of equipment. The cost towards replacement will have to be borne by the supplier.		
06	MAF Format – Page No 23		Please allow MAF as per Original Equipment Format.	The change is accepted, subject to the MAF including all aspects that are covered in the letter as outlined in Annexure in the tender document
07	Page no: 3, Clause 2d	Self-Attested copy of VAT/ CST, Service Tax Number/ Registration certificate, GST as applicable.	Kindly delete VAT/CST/Service Tax No, GST is applicable	The terms and conditions are consistent with other tender issued for the same project. No change.
08	Page 3&26, Clause 2e&5, (2.1.e)	A certificate by the auditor/ CA/ CS indicating the turnover of the firm should be enclosed. The bidder should have minimum average turnover of Rs 1.83 Crore in last three financial years. Where in as per tender clause 05 (2.1.e) it is mentioned A certificate by the auditor/ CA/ CS indicating the turnover of	Please confirm the average turnover certificate, since it is not clear from tender terms & Checklist.	Average turnover required is Rs 1.83Cr

		the firm should be enclosed. The bidder should have minimum average turnover of Rs 2.4 Crore in last three financial years.		
09	Page 4, Clause 2g	Relevant ISO certificate in Laboratory Infrastructure.	Kindly amend the relevant ISO Certificate in Laboratory Infrastructure to Laboratory Infrastructure/IT Infrastructure. Please note that the project is for setting up of control systems laboratory which is part of IT/ICT test equipment. Please note even tender page 26 sl no:7 of the tender asks for ISO in IT Infrastructure.	The query is already answered in #3 above
10	Page 4&6, Clause 2i, 4.2	The copy of Supply Orders/ Contracts/ Agreements issued by/ signed with Government of India (Ministry/ Department/ Undertaking/ PSU/ Educational Institutions such as IIT's, NIT's, or other such Central Universities/Banking sector/IT-SEZs/Technology parks/ Stock/Commodity exchanges and reputed private organizations including educational institutions in India) for similar work, executed by the bidders in last five years ending December 31st 2017. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should have completed at least ONE similar work not less than Rs. 4.88 Crore OR TWO similar works not less than Rs. 3.05 Crore each OR THREE similar works not less than 2.44 Crore each. The similar work means supply & installation of all/ most of the items mentioned in this tender document in a single	Similar work should mean setup of any scientific /ICT/IT lab instead of lab with similar items. We request that this definition should be changed wherever it is appearing in the tender document. As leading integrator we have setup labs at ERTL for MNRE for testing or solar panels and also language lab with ICT infrastructure.	The query is already answered in #3 above

		project on turn-key basis in India/abroad.		
11	Page 7, Clause 4.6	Bidder should be registered with Sales Tax/ Income Tax Department of Government of India and should possess a valid VAT/ CST, Service Tax Number/ Registration as on date of bid submission.	Please amend- Bidder should be registered with sales tax/Income tax department of Government of India and should possess a valid GST and PAN registration as on date of submission.	The terms and conditions are consistent with other tender issued for the same project. No change.
12	Page 6, Sl no 1	Delivery Timelines The delivery and installation at site(s) must be completed within 70 days from the date of placement of supply order by IIIT Bangalore. All the necessary spare parts and tools required for installation and commissioning of the tendered item will have to be supplied along with the tendered items. The custom clearance of the equipment would be facilitated by Indian Mission in Myanmar. The tendered equipment will be exempted from payment of Myanmar custom duties. It is mandatory for the bidders who respond to this bid to meet these expectations as time is the essence of this contract and is tightly linked to completing the project within the available time frame.	Please extend the period of delivery and installation at site 70 days to 150 days, from the date of placement of supply order by IIIT Bangalore as these products are not on the shelf available. Moreover this would require proper packing, custom clearance in dispatch country, and custom clearance in host country. Time frame of 70 days is too less for delivery and installation at site.	The change is partially accepted. The revised delivery timelinee would now be 90 days from the date of supply order.
14		The copy of Supply Orders/ Contracts/ Agreements issued by/ signed with Government of India (Ministry/ Department/ Undertaking/ PSU/ Educational Institutions such as IIT's, NIT's, or other such Central Universities/Banking sector/IT-SEZs/Technology parks/ Stock/Commodity exchanges and reputed private organizations	Remove the experience of private orders as they cannot be verified and hence prone to misuse by bidders.	The terms and conditions are consistent with other tender issued for the same project. No change.

		including educational institutions in India		
15			Most of the quality manufacturer are located around the world and hence for sourcing India / third county should be allowed.	The terms and conditions are consistent with other tender issued for the same project. No change.
16	Section II, Instruction to bidders , Clause 4.2	The copy of Supply Orders/ Contracts/ Agreements issued by/ signed with Government of India (Ministry/ Department/ Undertaking/ PSU/ Educational Institutions such as IIT's, NIT's, or other such Central Universities/Banking sector/IT-SEZs/Technology parks/ Stock/Commodity exchanges and reputed private organizations including educational institutions in India) for similar work, executed by the bidders in last five years ending December 31st 2017. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should have completed at least ONE similar work not less than Rs. 4.88 Crore OR TWO similar works not less than Rs. 3.05 Crore each OR THREE similar works not less than 2.44 Crore each. The Tender Document for Supply, Installation, Testing,Commissioning(SITC) and onsite support for Control Systems Laboratory of MIlT Project, Mandalay, Myanmar 7 of 27 similar work means supply & installation of all/ most of the items mentioned in this tender document in a single project on turn-key basis in India/abroad.	Please allow past experience as setting up of any technical / IT lab for training / teaching / education/ research of Rs. 4.88 Crore OR TWO similar works not less than Rs. 3.05 Crore each OR THREE similar works not less than 2.44 Crore each.	The query is already answered in #3 above

17	Section II, Instruction to Bidders, Clause 1, Delivery Period	Delivery Period / Project Timelines: The delivery and installation at site(s) must be completed within 70 days from the date of placement of supply order by IIIT Bangalore.	Please allow more time for Completion at least 210 days from the date of placement of supply order by IIIT Bangalore.	The query is already answered in #12 above
18	Section III, SSC , Payment Terms	i. IIIT Bangalore shall release 5% of the payment upon purchase order subject to receipt of the performance bank guarantee as outlined in clause 8 below. ii. IIIT Bangalore shall release 35% of the payment upon dispatch of the tendered items subject to submission of original shipping documents and BL. iii. IIIT Bangalore shall release 30% of the payment upon delivery of the tendered items at MIIT subject to satisfactory certificate of receipt by Embassy of India, Yangon and/or MIIT/IIITBangalore. iv. Payment of 30% of the purchase order value will be made after physical verification by a Project Monitoring Committee (PMC). v. In case of foreign bidders who quoted in US $, letter of credit(LC) will be opened and payment would be released as per 7(1), 7(2), 7(3) and 7(4).	Please change payment terms to market friendly for wider participation and competitive price. 90% against proof of Delivery and 10% of the purchase order value made after physical verification by a Project Monitoring Committee (PMC) and submission of 10% Performance Bank Guarantee.	The terms and conditions are consistent with other tender issued for the same project. No change.
19	Page 24	Undertaking of Authenticity	Requesting you to change the Tender Terms & Conditions for the Supply, Installation, Testing, Commissioning (SITC) and onsite support for Control Systems Laboratory of MIlT Project, Mandalay, Myanmar	The change is accepted. The revised Undertaking format is provided in Annexure III
20	Page 12, Clause 7, Payment Terms	i. IIIT Bangalore shall release 5% of the payment upon purchase order subject to receipt of the performance bank guarantee as outlined in clause 8 below. ii. IIIT Bangalore shall release	Request to change the payment releasing terms as following as being high-value order.	The terms and conditions are consistent with other tender issued for the same project. No change.

		35% of the payment upon dispatch of the tendered items subject to submission of original shipping documents and BL. iii. IIIT Bangalore shall release 30% of the payment upon delivery of the tendered items at MIIT subject to satisfactory certificate of receipt by Embassy of India, Yangon and/or MIIT/IIITBangalore. iv. Payment of 30% of the purchase order value will be made after physical verification by a Project Monitoring Committee (PMC). v. In case of foreign bidders who quoted in US $, letter of credit(LC) will be opened and payment would be released as per 7(1), 7(2), 7(3) and 7(4).	a. IIIT Bangalore shall release 30% of the payment upon purchase order subject to receipt of the performance bank guarantee as outlined in clause 8, below. b. IIIT Bangalore shall release 30% of the payment upon dispatch of the tendered items subject to submission of original shipping documents and BL. c. IIIT Bangalore shall release 30% of the payment upon delivery of the tendered items at MIIT d. Payment of 10%, of the purchase order value, will be made after physical verification by a Project Monitoring Committee (PMC)	
21	Section II- Delivery period	The delivery and installation at site(s) must be completed within 70 days from the date of placement of supply order by IIIT Bangalore. All the necessary spare parts and tools required for installation and commissioning of the tendered item will have to be supplied along with the tendered items. The custom clearance of the equipment would be facilitated by Indian Mission in Myanmar. The tendered equipment will be exempted from payment of Myanmar custom duties. It is mandatory for the bidders who respond to this bid to meet these expectations as time is the essence of this contract and is tightly linked to completing the project within the available time frame.	We are requesting to extend the Delivery Period from 70days to 90days.	The query is already answered in #12 above

22	Section II, Clause 4.2	The copy of Supply Orders/ Contracts/ Agreements issued by/ signed with Government of India (Ministry/ Department/ Undertaking/ PSU/ Educational Institutions such as IIT's, NIT's, or other such Central Universities/Banking sector/IT-SEZs/Technology parks/ Stock/Commodity exchanges and reputed private organizations including educational institutions in India) for similar work, executed by the bidders in last five years ending December 31st 2017. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should also enclose the completion certificate duly issued by the end user. The bidder should have completed at least ONE similar work not less than Rs. 4.88 Crore OR TWO similar works not less than Rs. 3.05 Crore each OR THREE similar works not less than 2.44 Crore each. The similar work means supply & installation of all/ most of the items mentioned in this tender document in a single project on turn-key basis in India/abroad.	Order value for similar work is too high, as the same you need to ensure the credibility of a company. Anyway if you would like to ensure this, you can evaluate the company and its work by turnover. We are requesting you to keep this value may be Rs 50 lakh average for the last 3 years, also accept order from overseas partners as well. There should be some relaxation to the companies who has an experience to execute the project at your MIIT, Mandalay, Myanmar	The terms and conditions are consistent with other tender issued for the same project. No change.
23	Section II, Clause 4.3	The bidder should have minimum average turnover of Rs 1.83 Crore in the last three financial years.	We are requesting you to evaluate worth and credibility based on its average turnover atleast for last 3 years.	The terms and conditions are consistent with other tender issued for the same project. No change.
24	Page 26, Clause 1	The delivery and installation at site(s) must be completed within 70 days from the date of placement of supply order by IIIT Bangalore. All the necessary spare parts and tools required for installation and commissioning of the	As the site is in Mandalay, Myanmar and for the said tender lot of mechanical work is there hence delivery period should be minimum of 150 days from the date of receipt of order on us.	The query is already answered in #12 above

			tendered item will have to be supplied along with the tendered items. The custom clearance of the equipment would be facilitated by Indian Mission in Myanmar. The tendered equipment will be exempted from payment of Myanmar custom duties. It is mandatory for the bidders who respond to this bid to meet these expectations as time is the essence of this contract and is tightly linked to completing the project within the available time frame.		
25	Sl No: 1	Rotary Servo Modular kit with inertial disk and pendulum modules	The specifications mentioned in the tender are OEM specific.	Please see the revised specifications in Annexure II
			Such Kits required for "Control Lab" should have more fundamental learning & along with programming there should be some practical on hardware which should also be there.	
			Please note that there is no connection between protocol and pendulum study we therefore request you to remove the same.	
26	Sl No: 2	Mobile Ground Robot for Laboratory Instructions	The specifications mentioned in the tender are OEM specific	Please see the revised specifications in Annexure II
27			There should be some common / generalize controller like Arduino, AVR, Raspberry Pi, PIC etc. so that students can work and explore more.	Please see the revised specifications in Annexure II
28			Hardware expansion facility should be there for improvement of Robotic work in the Control Lab	Please see the revised specifications in Annexure II
29	Sl no: 3	Transducers, Instrumentation and Control Trainer	Please allow maximum onboard facility.	Please see the revised specifications in Annexure II
			The training system should not depend on PC, it should also work stand alone.	Please see the revised specifications in Annexure II

			Auto and manual characteristics facility should be there with training system	Please see the revised specifications in Annexure II
30	Sl No: 4	Programmable Logic Controller with the required software	Some general application modules must be added for better learning and utilization of PLC Platform.	Please see the revised specifications in Annexure II
31			The training setup should be universal so that can be used on other make PLC too.	Please see the revised specifications in Annexure II
32	Sl No: 5	Humanoid Robot Platform	The specifications mentioned in the tender are OEM specific.	Please see the revised specifications in Annexure II
			It should have more fundamental learning, along with programming there should be some practical on hardware should be there.	Please see the revised specifications in Annexure II
			There should be some common / generalize controller like Arduino, AVR, Raspberry Pi, PIC etc. so that students can work and explore more	Please see the revised specifications in Annexure II
33	Page 15, Sl No: 1	Rotary Servo Modular kit with inertial disk and pendulum modules	Regarding the specification floated in the tender, we wish to record strong objection that the specification are specific to 1(one) manufacturer ie., Quanser, Canada. In such case IIIT Bangalore shall receive only bids which quote for quanser brand with prices being controlled by quanser/their SI. This will lead to monopolistic situation and loss to the exchequer.	Please see the revised specifications in Annexure II
			Control lab such kit which should have more fundamental learning kits that shall also allow programming along with some practical on the hardware by giving more hands on the learning experience to students.	Please see the revised specifications in Annexure II
			Please note that there is no connection between protocol and pendulum study, we therefore request you to remove and amend the specifications	Please see the revised specifications in Annexure II

34	Page No: 15&16, Item 2	Mobile Ground Robot for laboratory instructions	Regarding the specification floated in the tender, we wish to record strong objection that the specification are specific to 1(one) manufacturer ie., Quanser, Canada. In such case IIIT Bangalore shall receive only bids which quote for quanser brand with prices being controlled by quanser/their SI. This will lead to monopolistic situation and loss to the exchequer.	Please see the revised specifications in Annexure II
			Kindly allow some common/generalize controller for eg: Raspberry PI, AVR, Aurdino etc. so that students can work and explore more.	Please see the revised specifications in Annexure II
			Kindly allow hardware expansion facility that should be there for improvement for robotic by the students while learning in the control lab.	Please see the revised specifications in Annexure II
35	Page 16&17, Sl no:3	Transducers, Instrumentation and control trainer	Please allow maximum onboard facility.	Please see the revised specifications in Annexure II
			The training system allowed to work on standalone	Please see the revised specifications in Annexure II
			Auto and manual characteristics facility should be there with training system	Please see the revised specifications in Annexure II
36	Page 17 , Sl No: 4	Programmable logic Controller with required software	Kindly add general application module for better learning and utilization of Programming Logic Controller platform with required software etc.

Kindly allow universal training setup so that it can be used on other OEM's, Programmable Logic Controller with required software etc. | Please see the revised specifications in Annexure II |
| 37 | Page 17&18, Sl No: 5 | Humanoid Robot Platform | The specifications mentioned in the tender are OEM specific | Please see the revised specifications in Annexure II |
| | | | Humanoid robot platform should have more fundamental learning for students which shall allow programming with some practical's on hardware & software on such devices. | Please see the revised specifications in Annexure II |

			There should be some common/generalize robotic controller so that students can work and explore more.	
38		Technical specification from page No 15 to page No 18.	The technical detailing in the tender is lifted from data sheet of certain company giving unfair advantage to them. Please have them changed to general and complying to at least top 5 Brands	Please see the revised specifications in Annexure II
39	Page 15	Rotary Servo Modular Kit	We are requesting to Mention the Experiment list of Disk & Pendulum	Please see the revised specifications in Annexure II
40	Page 15	Mobile Ground Robot for Laboratory Instructions	We are requesting to mention the integrating software as Matlab so that by using Matlab integration one can undergo the true engineering robotics in Various topics from basic to intermediate and advance.	Please see the revised specifications in Annexure II
			Usually, Ground Robot has the various scope of supply. For Engineering perspective, we are requesting to mention the experiment topics which usually anyone come across in Ground Vehicle system. Like Differential drive kinematics, Forward and inverse kinematics, Dead reckoning and odometric localization, Path planning, and obstacle avoidance, 2D mapping and occupancy grid map, Image acquisition, processing and reasoning, Localization and mapping, High-level control architecture of mobile robots, Vision-guided vehicle control	Please see the revised specifications in Annexure II

41	Page 16	Transducers, Instrumentation and Control Trainer	As for as tender specification concerns, we are understanding that it should be a Complete study of Input, output transducer; and incorporating the signal conditioning circuits with the transducer, we can perform basic closed-loop position control experiment without software. And PC interfacing and other communication protocol not mandatory. Kindly confirm same.	Please see the revised specifications in Annexure II
42	Page 17	Programmable Logic Controller	Along with the Quote, we can also go with our own basic application kit and it not mandatory. Simulation we can quote along with Software - but it's not mandatory. Kindly confirm.	Please see the revised specifications in Annexure II
43	Page 15	Rotary Servo Modular kit with inertial disk and pendulum modules A direct-drive brushed DC motor with a high resolution optical encoder providing position and velocity feedback, a built-in amplifier with integrated current sensor, an integrated data acquisition device and a computing interface for USB and SPI connections. Two add-on modules: an inertia disk and a pendulum, with full compatibility with MATLAB/Simulink. Open architecture design, allowing users to design their own controller. Specifications: Pendulum length (pivot to tip) - 9.5 cm Pendulum mass - 54 g Servomotor encoder resolution - 512 counts/revolution Inverted pendulum encoder resolution - 512 counts/revolution DC motor nominal voltage - 18 V DC motor nominal current - 0.54 A DC motor nominal speed (no load) - 4050 RPM Connector Standard USB	Pendulum Control system: Key Features: i)Control of inherently unstable systems and of systems with very oscillatory dynamics. ii) Study of control engineering theory. iii) Standalone analogue control. iv) Classic control model for analogue direct digital or fuzzy logic control. v) Two different modes, an inverted pendulum or overhead crane. vi) Software with attempted linear control, attempted harmonic control, direct digital control and fuzzy logic control. Mains Supply 110V AC, or 220-240V AC (Switch Select) Mains Fuses 2 x 5 amps Control unit fuses 2 x 250 mA Internal PSU +20V DC unregulated +15V DC regulated +10V DC regulated Maximum continuous torque 14Ncm Maximum Peal Torque	Please see the revised specifications in Annexure II

		2.0 Other features: • Fully documented system models and parameters provided for MATLAB®/Simulink® • Microcontroller examples and interfacing datasheet • Lab curriculum with Instructor and students manual • Native support of TCP/IP, UDP, serial, shared memory, named pipes, SPI, I2C, Peak CAN, ARCNET and other protocols • External communication interfacing provision in C/C++, MATLAB, and .NET languages	36Ncm Motor Voltage Constant 10.3V / 1000 RPM Motor Torque Constant 9Ncm/A Mechanical Time Constant 20 ms Rod Inertia 214gcm sq Tacho assembly inertia 10.5gcm sq Drive Belt Kevlar braided Angle Theta measured 5k servo potentiometer Position X measured 5k- multiturn potentiometer Control Software Multiple controllers with graphical output. Servo meter with integral tachometer normal supply voltage 24V DC , MATLAB solutions for DDC, inverted pendulum, crane. (Suggested product is general and useful to understand basic fundamentals of pendulum)	
44	Page 15	Mobile Ground Robot for Laboratory Instructions Specifications: Platform Mobile base Number of wheels – 2 Diameter - 35 cm Height - 27 cm Battery life - 3 hours Maximum linear speed - 0.7 m/s Available payload - app. 4.5 kg Sensors included - 3 digital bumper sensors; 3 digital wheel drop sensors; 3 analog and digital cliff sensors; 3-axis gyroscope; 2 wheel encoder inputs; 2 wheel speed outputs; 2 digital LED outputs; 4 digital power enable outputs; 2 analog motor current inputs; 3 digital buttons; 2 overcurrent sensors; 1 Z-axis angle measurement (heading); 1 battery voltage sensor; 1 RGBD sensor Additional I/O channels: 8 reconfigurable digital I/O channels; 4 analog input	Wireless Mobile Robocar Raspberry pi and arduino i.FT232 PCB for USB programming. ii. Motor driver IC's – L293d. iii. On board zigbee 2.4 Ghz for robotic control. iv. Sensor interfacing PCB, CBK male connectors plug able onboard. Sensor interface PCB with facility ultrasonic accelerometer(on range +(-)2g, +(-)4g, +(-)8g, +(-)16g) gyro scope(on range: +(-) 2g, +(-)4g, +(-)8g, +(-)16g) 4 analog sensors and 1 digital 6PWM servo meter optional USB 2.0 compatible for programming CB 16 Mhz crystal oscillator. Separate reset switch facility for zigbee controller. On board 4 SMD LED's or digital output indicator. Rechargeable batteries 8.4V/3000mAh(Lithium	Please see the revised specifications in Annexure II

		channels; 2 encoder input channels; 4 PWM output channels; 1 SPI bus channel; 1 UART serial port (interface 3.3 V serial device); 1 I²C serial bus channel On-board computer with integrated 802.11 b/g/n WiFi Memory - 1 GB DDR SDRAM, 32 MB Flash Maximum sample rate - 1,000 Hz Camera resolution - 640 x 480 Depth sensing - 11 bit Depth sensor range - 0.5 m – 6 m	battery) DC Charger supply volt/700 mAh. On board battery charger . On board separate supply +5V, +3.3 V. i.Board configuration and pin configuration ii. Programming on Raspberry Pi processor iii. Control DC motor iv. ultrasonic sensor v. zigbee interface with robot control vi. camera interface vii. IoT application and remote camera monitor vii. Gyro sensor with accelerometer viii. Software hardware interfacing ix. accelerometer interfacing x. gyroscope interfacing xi. LED interface xii. Learn to interface various sensor modules. (Suggested specifications are common and useful for robotic technocrat & currently raspberry pi and arduino are more popular for robotics advance applications design)	
45	Page 16	Transducers, Instrumentation and Control Trainer An integrated trainer containing the following elements on a single board, with the facility provided for the user to interconnect them. Input transducers: Wirewound & precision rotary potentiometer, Slide potentiometer, Thermistor, Thermocouple, Temperature sensor, Photoconductive cell, Photovoltaic cell, Phototransistor, PIN diode, Linear variable differential transformer, Linear variable capacitor, Strain gauge, Air-flow sensor, Air pressure sensor, Slotted optosensor, Reflective opto-sensor, Inductive proximity sensor, Hall effect sensor, Precision servo-potentiometer,	Product should have USB connectivity for keyboard, pendrive and data logging. Also it should have Ethernet port to connect with real world and remote view. This will help user to design IoT application and post signal data analysis. Also it should have inbuilt sensors data sheet and basic electronic circuit stimulation feasibility which helps students to design new and existing circuits testing.	Please see the revised specifications in Annexure II

| | | Tachogenerator, Humidity sensor, Dynamic microphone, Ultrasonic receiver. Output transducers/devices: Heater, Filament Lamp, DC Motor, Solenoid Air Valve, Ultrasonic transmitter, Buzzer, Loudspeaker, Relay, Solenoid, Counter/timer unit with LED display, Bargraph voltage indicator, Analog 10V center-zero meter. Signal conditioning circuits: Buffers, Inverters, Comparator with switchable hysteresis, Amplifiers with gain and offset control, Current amplifier, Summing amplifier, Differential amplifier, Instrumentation amplifiers, AC amplifier, Oscillator 40kHz, Filter 40kHz, Low-pass filter with switchable time constant, Precision full-wave rectifier, Sample and hold circuit, Integrator with switchable timeconstant, Differentiator with switchable time constant, V/F and F/V converters, V/I and I/V converters, Alarm oscillator with switchable latching, Power amplifier, Electronic switch. Integrated power supplies with display devices: -5V, +5V 1A precision supply, and -12V, +12V 1A regulated supply. 40 Tender Document for Supply, Installation, Testing, Commissioning(SITC) and onsite support for Control Systems Laboratory of MllT Project, Mandalay, Myanmar 17 of 27 A shaft assembly with a D.C. motor, tacho-generator, slotted and reflective opto-sensors for incremental and absolute position, and a 360 degree precision potentiometer with indicator dial for closed-loop position control experiments. Input supply | | |

		voltage: 50-60Hz 110-120V AC or 220-240V AC		
46	Page 17	Programmable Logic Controller with the required software With a mounting frame that gives access to the PLC's I/O capabilities providing an effective means for the student to test and debug the program prior to connecting to the application. All inputs and outputs to be colour coded safety sockets (4 mm) and 'D' type connectors. An integrated real time clock and a maintenance -free EEPROM with capacity for up to 2,000 program steps. Specifications I/O Capabilities – 8 inputs, 6 outputs Input Type - 24V DC Output Type – Relay Output Range - 24V AC / 5-30V DC Power Supply - 24V DC High processing speed - 0.55μs per log. instruction Program cycle period per logical instruction - 0.55 - 0.7 μs User memory - 2000 steps EEPROM (internal) Communications Port - RS232 Mounting Frame Type - PCB Mounted in a durable plastic box Connectors - 'D' Type for easy application connection PLC I/O Access - 12 x 4mm terminals Inputs - 12 x 4mm terminal outputs; 1 x 15 way connector outputs; 1x 15 way connector inputs; 8 outputs Test Switches - 8 x toggle switches and 4 button switches	Product should have software simulation facility, in the same software from which user can simulate first and then download to the PLC. This feature helps in developing logics without affecting hardware.

Hardware should have open wiring for student proper understanding and learning. Also extra input and output devices for students to explore hands-on.

Also, product should come with some application modules like conveyor control and traffic light control by PLC. | Please see the revised specifications in Annexure II |
| 47 | Page 17 | Humanoid Robot Platform Features: Camera, Object recognition, Face detection and recognition, speech recognition, sound detection and localization. Built-in motion reflexes: Stand up by itself when fallen down, arm does not collide with body Basic specifications Electrical: Input: 100 to 240 V, 50/60 | Walking robot can perform various effective movements like right kick, left kick, stretching, forward walk, and reverse walk. It is very easy to drive all these movements using menu switches and LCD provided on the main board. It can be controlled using wireless device, or using PC interface and software. | Please see the revised specifications in Annexure II |

| | | Hz Output: 25 Vdc, 2 A Battery: Lithium ion, 21.6 V, 2.15 Ah Connections Ehternet: 1xRJ45 – 10/100/1000 BASE T Wifi: IEEE 802.11b/g/n Degrees of Freedom (dof) Head: 2 Arm (each): 5 Pelvis: 1 Leg (in each): 5 Hand (in each): 1 1 Tender Document for Supply, Installation, Testing, Commissioning(SITC) and onsite support for Control Systems Laboratory of MIlT Project, Mandalay, Myanmar 18 of 27 Motors for: Head joints (2), arm joints (6), leg joints (6) Audio Loudspeakers: 2 Microphones: 4 on head Construction Dimension (HxDxW): 570 x 275 x 310 mm Weight: 5 kg Construction material: ABS-PC / PA-66 / XCF-30 Vision Cameras: 2 on front, 1.22MP, 1290x970 pixels, 72 deg FOV IR, Sonar, Force sensitive resistors, position sensors, gyrometers (2), accelerometer, LEDs, contact sensor | Walking robot is an ideal platform to enhance education, training, skills and development among our young minds.

Product Feautres.
i.6 DOF moving capability
ii. Main board featuring various ports and connectors for range of applications.
iii. Wireless RF controlled
iv) High torque metal geared servo motor
v) Moving robotic Arm
vi. Wireless Wi-Fi control
vii. 160x128 TFT Color LCD interface
viii. DC motor interface and control
ix. servo motor interface
x. switch interface
xi. expansion connectors for more experiments
xii. on board battery charger
xiii. PC based programming
xiv. Gripper for pick and place.
xv. Offline product tutorial

Scope of learning
i.Learn to interface servo motor
ii. Gaining knowledge about two legged walking principle
iii. gaining knowledge about advance level programming for forward/reverse 4 walking principle, right/left kick, stretching and many more
iv. learn wireless control over walking robot using RF module.
v. control using PC interface and software.
vi. learn the concept of pick and place robot.
vii. learn to interface color sensor and study of application like colour detection and sorting.
viii. gaining knowledge about robotics and ATmega128 microcontroller
ix. Wi-Fi module interface. | |

Annexure II

Revised Schedule of Requirements

Sr. no.	Item details	Qty.
1	**Linear inverted pendulum module** An inverted pendulum constrained to move along a linear path, with a programmable position and velocity, and a computing interface. Specifications: Input: 100 to 240 V, 50/60 Hz Total module weight: Less than 15 kg Pendulum travel distance: 250mm or more Connector: Standard USB 2.0 Program interfacing with C/C++ and/or MATLAB and/or other languages The following are desirable, but not mandatory: Instructor and students manual for lab instructions. Sample demonstration programs including source code.	40
2	**Mobile Ground Robot for Laboratory Instructions** A microcontroller based, wireless controlled vehicle with the following minimum specifications: An 8-bit or 16-bit on board microcontroller, programmable in C Number of wheels: 2, 3 or 4 Wireless control through: WiFi and/or Zigbee and/or Bluetooth On board camera with 640 x 480 minimum resolution Sensors – Infrared, ultrasonic, accelerometer, gyroscope, 3 or more analog sensors, 1 or more digital sensors; additional sensors will add value. Appropriate sensor interfacing modules for each sensor. Output indicators: LEDs and/or other digital displays	40

3	**Transducers, Instrumentation and Control Trainer**
	
	An integrated trainer kit with the following either included in the kit itself, or having the facility to be connected:
	
	Input transducers (15 or more of the following):
	      Accelerometer
	      Capacitive displacement
	      Capacitive proximity
	      Clap
	      Gas
		40

	Humidity		

Humidity
Inductive proximity
IR
Light
Magnetic (Hall effect)
Microphone
Photovoltaic
Phototransistor
Piezoelectric
 Potentiometer (1 or more types)
Pressure
Slotted opto
 Smoke
 Strain gauge
Tachogenerator
Temperature (1 or more types)
Ultrasonic
Variable capacitor
Output transducers/devices (6 or more of the following):
Buzzer
DC motor
Heater
LEDs
Loudspeaker
Relay
Ultrasonic transmitter
Voltage indicator/Voltmeter.
On board circuits:
A/D converter (2 or more channels)
Amplifiers (2 or more types)
Buffers
Comparator
F/V and V/F converters
 High pass and Low pass filters
Oscillator
Rectifier
Switches
Integrated power supplies and display devices.
Input supply voltage: 50-60Hz 110-120V AC or 220-240V AC

4	**Programmable Logic Controller with the required software** Facility to test and debug the program prior to connecting to the application. All inputs and outputs to be colour coded, with safety sockets and connectors. An integrated real time clock and a maintenance -free EEPROM with capacity for up to 2,000 program steps. Specifications:	40

| | | I/O Capabilities – 8 inputs, 6 outputs
Input Type - 24V DC
Output Type – Relay
Output Range - 24V AC / 5-30V DC
Power Supply - 24V DC
High processing speed - 0.55µs per log. instruction
Program cycle period per logical instruction - 0.55 - 0.7 µs
User memory - 2000 steps EEPROM (internal)
Communications Port - RS232
Mounting Frame Type - PCB Mounted in a durable plastic box
Connectors - 'D' Type for easy application connection
PLC I/O Access - 12 x 4mm terminals
Inputs - 12 x 4mm terminal outputs; 1 x 15 way connector outputs; 1x 15 way connector inputs; 8 outputs
Test Switches - 8 x toggle switches and 4 button switches | |
| 5 | **Programmable Humanoid Robot**

A human-like robot, with two arms, two legs, a body and a head, made of metal or polymer or plastic or equivalent.

Specifications:
Input: 100 to 240 V, 50/60 Hz
On board embedded controller (8-bit, 16-bit or higher)
Wireless remote controller
Various programmable motions
On board battery
Degrees of Freedom (dof): 6 or more
Dimension: At least 30 cm height
Cameras (at least 1): 250 kilopixels or more, 72 deg FOV
The following sensors are desirable, but not mandatory: IR, Sonar, Force sensitive resistors, position, gyrometer, accelerometer, LEDs, contact sensor, microphone. | 10 |

Annexure III

Undertaking of Authenticity

Sub: Supply of Control Systems Laboratory Equipment's

Ref: 1. Your Purchase Order No. ------------dated-------.

         2. Our invoice no/Quotation no. -------dated--------.

With reference to the Control Systems Laboratory Equipment being supplied /quoted to you vide our invoice no/quotation no/order no. Cited above,----

We hereby undertake that all the components/parts/assembly/software used in the Control Systems Equipment shall be original new components/parts/ assembly /software only, from respective OEMs of the products and that no refurbished/duplicate/ second hand components/parts/ assembly / software are being used or shall be used.

We also undertake that in respect of licensed operating system if asked for by you in the purchase order, the same shall be supplied along with the authorised license certificate (eg Product Keys on Certification of Authenticity in case of Microsoft Windows Operating System) and also that it shall be sourced from the authorised source (eg Authorised Microsoft Channel in case of Microsoft Operating System).

Should you require, we hereby undertake to produce the certificate from our OEM supplier in support of above undertaking at the time of delivery/installation. It will be our responsibility to produce such letters from our OEM supplier's at the time of delivery or within a reasonable time.

In case of default and we are unable to comply with above at the time of delivery or during installation, for the Control Systems Laboratory Equipment already billed, we agree to take back the equipment without demur, if already supplied and return the money if any paid to us by you in this regard.

We (system OEM name) also take full responsibility of both Parts & Service SLA as per the content even if there is any defect by our authorized Service Centre/ Reseller/SI etc.

Authorised Signatory

Name:

Designation

Place

Date