INDIAN INSTITUTE OF TECHNOLOGY KANPUR
DEPARTMENT OF COMPUTER SCIENCE & ENGG

To
M/S _____
_____

IITK/CSE/2018-19/56
27th July 2018

Sub. **Quotation for Modular Manufacturing System**

We are interested in purchasing the following desktops having the following specs. You are requested to send your sealed quotations along with compliance report, for the below listed product, as per given specifications. The envelope must be inscribed with "**Quotation for Modular Manufacturing System".**

Last date to submit your bids is 16th Aug 2018 by 1500 hrs.

Technical details as below:

Scope: This specification covers supply, erection, testing, installation, commissioning & 15 days hand's on training of the mechatronics system at site.

General specifications:

1. The mechatronics system kit shall be of sleek design and portable one with castor wheels
2. The mechatronics system shall be provided with standard Aluminium based mounting board (modular type) so as to make the mounting of components easier
3. The mechatronics system shall be possible for interconnecting with different upstream and downstream stations
4. All the products to be provided with suitable one touch fittings.
5. All the components used shall be of reputed make and the Vendor shall specify the make and submit the proposal with complete technical catalogue
6. Vendor to provide the learning resources –Pneumatics, electro pneumatics, programmable logic controllers
7. Operation & maintenance manual to be supplied – 1 set hard copy and 1 set soft copy with the equipment's

Learning objectives:

1. To build a mechatronics system for industrial scenarios
2. To understand the concepts of technology Mechanics, Pneumatics, Vacuum, Electrical drives, Sensors, PLC controls, Communication interfaces
3. To Learn about Mechanical set up of a Machine
4. To learn about Pneumatic linear and Rotary drives
5. To know about the Pneumatic & Electrical connections
6. Selection of sensors for various applications
7. Material handling techniques like conveyor, linear or rotary pick and place units
8. PLC programming using Ladder Logic
9. Fault finding techniques

Scope of supply:

1.	Feeder Station	-	1no
2.	Inspection Station	-	1no
3.	Buffer Station	-	1no
4.	Process Station	-	1no

5. Sorting Station - 1no
6. PLC Software And Accessories - 1 Set
7. Assembly Templates - 1 Set
8. Technical Documents - 1 Set
9. Work Piece set - 1 Set

Feeder station: The Feeder Station should be possible to separate the components from the Stack Magazine and distribute the components one by one via rotary pick and place module for further processing. The Station should be consist of the following major parts

- Dispensing module
- Rotary Pick and Place module
- Horizontal Profile Table work bench with castor wheels
- PLC Board
- Control Console
- I/O Interface Module
- Valve manifold

The Dispensing module should separate the jobs stacked in magazine tube with the help of pneumatic cylinder and provisions should be made for detecting the availability of jobs with optical sensors. Rotary Pick and Place module should have a rotary actuator with an arm and suction cup to pick up work pieces and relocate them to positions from '0 degree to 180 degrees' on horizontal plane, so as to feed the subsequent stations. The end position of all pneumatic actuators should be detected by using Magnetic sensors.

The feeder station should consist of aluminium anodized profile table, filter regulator and lubricator unit with pressure gauge, solenoid valve, one touch fittings mounted with suitable mountings for easy assembly and disassembly.

Networking and signaling the subsequent station for further processing should be done by establishing I/O communication between the PLC's of subsequent stations. The PLC used for the station should be capable of handling digital inputs and outputs, and it should have Ethernet interface to communicate with PC for programming

Scope of supply:

S. No	Item with description	Qty
1.	Horizontal Aluminium profile table: a. (L x W x H)- 540 x 640 x 790 mm b. Aluminium profile Table top profile – 40 x 160 mm Supporting profile- 40 x 40 mm c. Grid spacing(From slot to slot) – 40 mm d. Profile groove width – 8.3 mm e. Leveling casters for quick setting and smooth movement f. Profile plate connectors: Length 55 mm, thickness 5mm Mounting method M6 Socket head screw with M6 hammer head nut	1
2.	I/O Interface module: a. 25 Pin D-Sub connector interface board for interfacing valves and actuators	1

	b. 25 Pin D-Sub cable for transferring the I/O to the terminals which in turn are to be connected to PLC	
3.	Valve Manifold: a. L x W x H : 60 X 26.5 X 65 mm b. Grid spacing – 19 mm c. Mountable valve port size 1/8'' d. Provided with Conical silencers for reducing the dB level of exhausted air e. 5/2 Double solenoid pilot operated valve: Material- Extruded aluminium with anodized Finish Size – 1/8 '' Design – Spool type Pressure range – 2 – 10 bar Flow rate – 450 l / min Manual override- Resetting Fitted with 1/8'' flow control valve for varying the flow	1
4.	Filter Regulator Combination with Lubricator (FRL Unit) with pressure gauge and start up valve: a. Port size -1/4 inch b. Flow rate – 500 l/min c. Maximum supply pressure – 10 bar d. Operating pressure- 6 bar e. Filtering element grade – 40 µm f. Minimum operating flow – 12 l/min g. Filter Bowl capacity – 9 ml h. Lubricator Bowl capacity – 20 ml i. Connection for tube 8 dia input and 8 dia output j. Mounting – Socket head cap screw with M6 hammer head nut	1

S. No	Item with Description	Qty
5.	Stack Magazine module: a. Comprising of Miniature cylinder of dia 25 and stroke 80 mm Height: 516 mm, Width: 125 mm and Length: 390 mm b. Magnetic sensor for position sensing c. Light barrier Module : Type : Infra -red Sensing range: 2m Supply Voltage and Current: 10 to 30V DC (10% max. ripple) @ 20 mA max current, Switch output: PNP, normally open/normally Output Protection: Protected against false pulse on closed contact power- up, short-circuit protected	1
6.	Rotary Pick & Place Module : a. Cylinder rotation angle (rotary cylinder fitted with shock absorbers),180 degrees (freely selectable) b. Compact guided cylinder dia 40 mm, Stroke - 50 mm c. Height: 325.5 mm, Width: 127 mm, Length: 223 mm d. Magnetic sensor for position sensing	1
7.	Vacuum Ejector Module : a. Integrated energy saving function b. Brightly-lit display screen or LED bar display c. Automatic blow off function d. Vacuum Ejector module shall capable of handling 100gm	1
8.	Control console: a. Cycle start push button –Green with illuminated b. Auto /Manual selector switch -Black c. Home position push button –Red with illuminated	1

	d. Emergency button -Red	
9.	Cable duct and accessories: a. Wire duct size 45x25 b. Fastening screws	1
10.	PLC control panel with S7 1200 PLC: a. Power supply: Input voltage :230/115 V AC (47 – 63 Hz), Output voltage: 24 V DC ,short-circuit-proof Output current: Maximum 3A b. Miniature circuit breaker DC voltage with max.5A current rating c. Digital inputs-14,Digital outputs 10, Analog inputs 2Ethernet interface 1 x TCP/IP, 10 Mbit/s d. Terminal blocks e. 25pin D-sub I/O data cable length 1.5 m, wire used 0.25 mm^2 f. Cable ducts g. Power Connection cable:3pin plug with length of 1.3m	1
11.	Technical documents for Feeder Station: Should contain complete technical details of the station according to DIN ISO 1219 standard. It should include Pneumatic circuit, Electrical circuit, IO list, Functional description etc.,	1

Inspection station: The Inspection station should be possible to measure the height of the components received from its downstream station and transfer the correct and incorrect components to appropriate slides
The Inspection station should be consist of the following major parts

- Measuring module
- Horizontal Profile Table work bench with castor wheels
- PLC Board
- Control Console
- I/O interface module
- Valve manifold
- Slide module

Measuring module should check the jobs for height of about 25 mm using analog sensors and provisions should be made to detect work piece availability with the help of optical or capacitive sensors. An arrangement is to be provided to transfer the right work piece by a slide to the next station and send faulty rejected work piece to the rejection bay.

The inspection station should consist of aluminium anodized profile table, filter regulator and lubricator unit with pressure gauge, solenoid valve, one touch fittings mounted with suitable mountings for easy assembly and disassembly

Networking and signaling the subsequent station for further processing should be done by establishing I/O communication between the PLC's of subsequent stations. The PLC used in this station should be capable of handling various digital inputs/ outputs and analog inputs, and it should have Ethernet interface to communicate with PC for programming

Scope of supply:

S. No	Item with description	Qty
1.	Horizontal Aluminium profile table: a. (L x W x H)- 540 x 640 x 790 mm	1

	b. Aluminium profile Table top profile – 40 x 160 mm Supporting profile- 40 x 40 mm c. Grid spacing(From slot to slot) – 40 mm d. Profile groove width – 8.3 mm e. Leveling casters for quick setting and smooth movement f. Profile plate connectors: Length 55 mm, thickness 5mm Mounting method M6 Socket head screw with M6 hammer head nut	
2.	I/O Interface module: a. 25 Pin D-Sub connector interface board for interfacing valves and actuators b. 25 Pin D-Sub cable for transferring the I/O to the terminals which in turn are to be connected to PLC	1
3.	Valve Manifold: a. L x W x H : 60 X 26.5 X 65 mm b. Grid spacing – 19 mm c. Mountable valve port size 1/8'' d. Provided with Conical silencers for reducing the dB level of exhausted air e. 5/2 Double solenoid pilot operated valve: Material- Extruded aluminium with anodized Finish Size – 1/8 '' Design – Spool type Pressure range – 2 – 10 bar Flow rate – 450 l / min Manual override- Resetting Fitted with 1/8'' flow control valve for varying the flow	1
4.	Filter Regulator Combination with Lubricator (FRL Unit) with pressure gauge and start up valve: a. Port size -1/4 inch b. Flow rate – 500 l/min c. Maximum supply pressure – 10 bar d. Operating pressure- 6 bar e. Filtering element grade – 40 µm f. Minimum operating flow – 12 l/min g. Filter Bowl capacity – 9 ml h. Lubricator Bowl capacity – 20 ml i. Connection for tube 8 dia input and 8 dia output j. Mounting – Socket head cap screw with M6 hammer head nut	1

S. No	Item with description	Qty
5.	Measuring module: a. Pneumatic Linear Drive of dia 25mm and Stroke 100 mm b. LVDT with signal conditioner: Maximum permissible applied voltage - 42V Output: 4 – 20 mA Overall length – 94.4 mm c. Diffuse Sensor : Type : Infra red Sensing range: 15mm Supply Voltage and Current: 10 to 30V DC (10% max. ripple) @ 20 mA max current Switch output: PNP, normally open/normally closed contact Output Protection: Protected against false pulse on power-up, short-circuit protected	1
6.	Approve and rejection Slide Module	1
7.	Control console: a. Cycle start push button –Green with illuminated	1

	b. Auto /Manual selector switch -Black c. Home position push button –Red with illuminated d. Emergency button -Red	
8.	Cable duct and accessories: a. Wire duct size 45x25 b. Fastening screws	1
9.	PLC control panel with S7 1200 PLC: a. Power supply: Input voltage :230/115 V AC (47 – 63 Hz), Output voltage: 24 V DC ,short-circuit-proof Output current: Maximum 3A b. Miniature circuit breaker DC voltage with max.5A current rating c. Digital inputs-14,Digital outputs 10, Analog inputs 2Ethernet interface 1 x TCP/IP, 10 Mbit/s d. Analogue module: Analogue input(4-20mA) e. Terminal blocks f. 25pin D-sub I/O data cable length 1.5 m, wire used 0.25 mm^2 g. Cable ducts h. Power Connection cable:3pin plug with length of 1.3m	1
10.	Technical documents for Inspection Station: Should contain complete technical details of the station according to DIN ISO 1219 standard. It should include Pneumatic circuit, Electrical circuit, IO list, Functional description etc.,	1

Buffer station: Buffer Station should ensure steady flow of components to the process station by allowing one component at a time for processing. It should be able to store upto 5 work pieces at a time and if the count has exceeded 5, it should communicate with the upstream stations to hold the supply of the job until there is a demand from the downstream station.
Buffer Station consists of the following

- Conveyor module
- Horizontal Profile Table work bench with castor wheels
- PLC Board
- Control Console
- I/O interface module
- Valve manifold

Buffer station should be capable of buffering up to 5 jobs. Buffering process should be controlled by a separator using upstream and downstream photo electric sensors. Retro reflective sensor is to be used to detect the inserted job and keep tag on the numbers of jobs buffered precisely while the separator module passes the job to the next station, if the transfer point is free. The buffer station should wait for the signal from the downstream station for transferring the job. The end position of all pneumatic actuators is detected by using Magnetic sensors.
The buffer station consists of aluminium anodized profile plate, filter regulator and lubricator unit with pressure gauge, on/off valve quick push connections and couplings mounted with suitable mountings for easy assembly and disassembly.

Conveyor module should be driven by DC motor along with the driver unit which has provisions to change the speed, the direction of rotation and other functions. A retro reflective sensor should be provided at the beginning of the conveyor to detect the presence of job. Pneumatically actuated separator module should be provided for performing the buffer action. Through beam sensor to be provided for subtracting the count after the work piece has reached the separator module. Diffuse sensor should be used to detect the presence of object between the separator module.

Networking and signaling the subsequent station for further processing should be done by establishing I/O communication between the PLC's of subsequent stations. The PLC used in this station should be capable of handling various digital inputs/ outputs, and it should have Ethernet interface to communicate with PC for programming

Scope of supply:

S. No	Item with description	Qty
1.	Horizontal Aluminium profile table: a. (L x W x H)- 540 x 640 x 790 mm b. Aluminium profile Table top profile – 40 x 160 mm Supporting profile- 40 x 40 mm c. Grid spacing(From slot to slot) – 40 mm d. Profile groove width – 8.3 mm e. Leveling casters for quick setting and smooth movement f. Profile plate connectors: Length 55 mm, thickness 5mm Mounting method M6 Socket head screw with M6 hammer head nut	1
2.	I/O Interface module: a. 25 Pin D-Sub connector interface board for interfacing valves and actuators b. 25 Pin D-Sub cable for transferring the I/O to the terminals which in turn are to be connected to PLC	1
3.	Valve Manifold: a. L x W x H : 60 X 26.5 X 65 mm b. Grid spacing – 19 mm c. Mountable valve port size 1/8'' d. Provided with Conical silencers for reducing the dB level of exhausted air e. 5/2 Double solenoid pilot operated valve: Material- Extruded aluminium with anodized Finish Size – 1/8 '' Design – Spool type Pressure range – 2 – 10 bar Flow rate – 450 l / min Manual override- Resetting Fitted with 1/8'' flow control valve for varying the flow	1
4.	Filter Regulator Combination with Lubricator (FRL Unit) with pressure gauge and start up valve: a. Port size -1/4 inch b. Flow rate – 500 l/min c. Maximum supply pressure – 10 bar d. Operating pressure- 6 bar e. Filtering element grade – 40 µm f. Minimum operating flow – 12 l/min g. Filter Bowl capacity – 9 ml h. Lubricator Bowl capacity – 20 ml i. Connection for tube 8 dia input and 8 dia output j. Mounting – Socket head cap screw with M6 hammer head nut	1

S. No	Item with description	Qty
5.	Conveyor Module: a. Flat belt conveyor with overall length of 500mm b. Conveyor to be driven by 24V DC motor of reputed make c. Conveyor to be provided with electronic drive unit for regulating the speed, reversing	1

	the direction and other function d. Separator Module: Comprising of 2 pneumatic cylinders of dia 25 mm and stroke 25mm e. Retro reflective -Photo electric sensor(Upstream): Type : Infra red Sensing range: 2m Supply Voltage and Current: 10 to 30V DC (10% max. ripple) @20mA max current Switch output: PNP, normally open/normally closed contact Output Protection: Protected against false pulse on power-up,short circuit protected f. Thru beam -Photo electric sensor(Downstream): Type : Infra red Sensing range: 2m Supply Voltage and Current: 10 to 30V DC (10% max. ripple) @ 20 mA max current Switch output: PNP, normally open/normally closed contact Output Protection: Protected against false pulse on power-up, short-circuit protected g. Diffuse Sensor - Photo electric : Type : Infra red Sensing range: 15mm Supply Voltage and Current: 10 to 30V DC (10% max. ripple) @ 20 mA max current Switch output: PNP, normally open/normally closed contact Output Protection: Protected against false pulse on power-up, short-circuit protected	
6.	Control console: a. Cycle start push button –Green with illuminated b. Auto /Manual selector switch -Black c. Home position push button –Red with illuminated d. Emergency button -Red	1
7.	Cable duct and accessories: a. Wire duct size 45x25 b. Fastening screws	1
8.	PLC control panel with S7 1200 PLC: a. Power supply: Input voltage :230/115 V AC (47 – 63 Hz), Output voltage: 24 V DC ,short-circuit-proof Output current: Maximum 3A b. Miniature circuit breaker DC voltage with max.5A current rating c. Digital inputs-14,Digital outputs 10, Analog inputs 2Ethernet interface 1 x TCP/IP, 10 Mbit/s d. Terninal blocks e. 25pin D-sub I/O data cable length 1.5 m, wire used 0.25 mm^2 f. Cable ducts g. Power Connection cable:3pin plug with length of 1.3m	1
9.	Technical documents for Buffer Station: Should contain complete technical details of the station according to DIN ISO 1219 standard. It should include Pneumatic circuit, Electrical circuit, IO list, Functional description etc.,	1

Process station: the process Station should be possible to demonstrate drilling operation on a pneumatically driven rotary indexing table and transfer the work piece via Pick and place module to downstream Station. The Process Station should be consist of the following

- Rotary Indexing table module
- Drilling module
- Linear Pick and Place module
- Horizontal Profile Table work bench with castor wheels
- PLC Board, Control Console, I/O interface module
- Valve manifold

The processing station should be capable of demonstrating drilling operation using a pneumatically driven drilling machine for jobs placed on pneumatically operated rotary indexing table. A pneumatic linear drive module should move the drill unit up and down. Provisions should be made to sense the presence of the incoming work piece in order to proceed with further operation. The station should be provided with linear pick and place module to transfer the job to the next station.

The station should consist of aluminium anodized profile plate, filter regulator and lubricator unit with pressure gauge, on/off valve quick push connections and couplings mounted with suitable mountings for easy assembly and disassembly.

The rotary indexing table should be driven by a pneumatic cylinder to index the jobs at an angle of 60 degrees/each time. Aluminum anodized plate can be mounted on top of the rotary indexing table with a provision to sense the presence of the incoming work piece in order to proceed with further operation. Drilling module should consist of a drilling machine and the up and down movement of the drilling machine should be carried out using pneumatic linear drive unit. The transfer of work piece to the subsequent station should be done by a linear pick and place unit with vacuum cups as the end effector. The end position of all pneumatic actuators is detected by using Magnetic sensors.

Networking and signaling the subsequent station for further processing should be done by establishing I/O communication between the PLC's of subsequent stations. The PLC used in this station should be capable of handling various digital inputs/ outputs, and it should have Ethernet interface to communicate with PC for programming

Scope of supply:

S. No	Item with description	Qty
1.	Horizontal Aluminium profile table: a. (L x W x H)- 540 x 640 x 790 mm b. Aluminium profile Table top profile – 40 x 160 mm Supporting profile- 40 x 40 mm c. Grid spacing(From slot to slot) – 40 mm d. Profile groove width – 8.3 mm e. Leveling casters for quick setting and smooth movement f. Profile plate connectors: Length 55 mm, thickness 5mm Mounting method M6 Socket head screw with M6 hammer head nut	1
2.	I/O Interface module: a. 25 Pin D-Sub connector interface board for interfacing valves and actuators b. 25 Pin D-Sub cable for transferring the I/O to the terminals which in turn are to be connected to PLC	1
3.	Valve Manifold: a. L x W x H : 60 X 26.5 X 65 mm b. Grid spacing – 19 mm c. Mountable valve port size 1/8'' d. Provided with Conical silencers for reducing the dB level of exhausted air e. 5/2 Double solenoid pilot operated valve: Material- Extruded aluminium with anodized Finish Size – 1/8 '' Design – Spool type	1

	Pressure range – 2 – 10 bar Flow rate – 450 l / min Manual override- Resetting Fitted with 1/8'' flow control valve for varying the flow	
4.	Filter Regulator Combination with Lubricator (FRL Unit) with pressure gauge and start up valve: a. Port size -1/4 inch b. Flow rate – 500 l/min c. Maximum supply pressure – 10 bar d. Operating pressure- 6 bar e. Filtering element grade – 40 µm f. Minimum operating flow – 12 l/min g. Filter Bowl capacity – 9 ml h. Lubricator Bowl capacity – 20 ml i. Connection for tube 8 dia input and 8 dia output j. Mounting – Socket head cap screw with M6 hammer head nut	1

S. No	Item with description	Qty
1.	Rotary indexing table module: a. Pneumatically driven rotary indexing table capable of handling load upto 50 kg b. Indexing table to be driven by cylinder of Ø 40 x 75 mm c. Indexing angle 60 degrees d. Indexing plate diameter-320 mm e. Diffuse Sensor : Type : Infra red Sensing range: 15mm Supply Voltage and Current: 10 to 30V DC (10% max. ripple) @ 20 mA max current Switch output: PNP, normally open/normally closed contact Output Protection: Protected against false pulse on power-up, short-circuit protected	1
2.	Drilling Module: a. Drilling machine to be mounted on pneumatic linear drive of stroke 100mm b. Pneumatic drilling machine:No-load Speed : 3000 rpm, Weight : 1.4 Kg	1`
3.	Pick and Place module a. Rod less cylinder – dia 25 mm x 250 mm stroke b. Aluminium profile pillar – 80 x 80 mm c. Rod less cylinder mounting profile- 40 x 40 mm d. Twin rod cylinder- 15 mm stroke length e. Vacuum gripper with suction pad	1
4.	Control console: a. Cycle start push button –Green with illuminated b. Auto /Manual selector switch -Black c. Home position push button –Red with illuminated d. Emergency button -Red	1
5.	Vacuum Ejector Module : a. Integrated energy saving function b. Brightly-lit display screen or LED bar display c. Automatic blow off function d. Vacuum Ejector module shall capable of handling 100gm	1
6.	Cable duct and accessories: a. Wire duct size 45x25 b. Fastening screws	1
7.	PLC control panel with S7 1200 PLC: a. Power supply: Input voltage :230/115 V AC (47 – 63 Hz), Output voltage: 24 V DC ,short-circuit-proof Output current: Maximum 3A b. Miniature circuit breaker DC voltage with max.5A current rating c. Digital inputs-14,Digital outputs 10, Analog inputs 2Ethernet interface 1 x TCP/IP, 10 Mbit/s	1

	d. Terminal blocks e. 25pin D-sub I/O data cable length 1.5 m, wire used 0.25 mm2 f. Cable ducts g. Power Connection cable:3pin plug with length of 1.3m	
8.	Technical documents for Process Station: Should contain complete technical details of the station according to DIN ISO 1219 standard. It should include Pneumatic circuit, Electrical circuit, IO list, Functional description etc.,	1

Sorting station: sorting station should be possible to sort the incoming work piece based on colour and material characteristics to appropriate slides. The sorting station consists of the following

- Sorting Conveyor module
- Horizontal Profile Table work bench with castor wheels
- PLC Board
- Control Console
- I/O interface module
- Valve manifold
- Slide module

The sorting station should have 3 slides to sort the incoming jobs based on its material and color. The conveyor module should be fitted with sensors to sense the presence of jobs at the start of the conveyor. Inductive sensors and colour sensors to be used to detect whether the material is metallic or non-metallic & its colour respectively, and divert them to the appropriate slides. A pneumatically actuated sorting arrangement is to be provided to extend for pushing the work pieces onto the appropriate slides.

The station should consist of anodized profile table, filter regulator and lubricator unit with pressure gauge, on/off valve quick push connections and couplings mounted with suitable mountings for easy assembly and disassembly.

The conveyor module should have DC motor driven conveyor belt which shall carry the job to the appropriate location on the station while the inductive and color sensor detect the material and color of the jobs carried along the conveyor. The pneumatically operated sorting guides to be provided to sort the work pieces into various slides as per colors and material. The presence of the work piece in the station is to be detected using diffuse sensor. The end position of all pneumatic actuators should be detected by using Magnetic sensors.

Networking and signaling the subsequent station for further processing should be done by establishing I/O communication between the PLC's of subsequent stations. The PLC used in this station should be capable of handling various digital inputs/ outputs, and it should have Ethernet interface to communicate with PC for programming

Scope of supply:

S. No	Item with description	Qty
1.	Horizontal Aluminium profile table: a. (L x W x H)- 540 x 640 x 790 mm b. Aluminium profile Table top profile – 40 x 160 mm Supporting profile- 40 x 40 mm c. Grid spacing(From slot to slot) – 40 mm d. Profile groove width – 8.3 mm	1

	e. Leveling casters for quick setting and smooth movement f. Profile plate connectors: Length 55 mm, thickness 5mm Mounting method M6 Socket head screw with M6 hammer head nut	
2.	I/O Interface module: a. 25 Pin D-Sub connector interface board for interfacing valves and actuators b. 25 Pin D-Sub cable for transferring the I/O to the terminals which in turn are to be connected to PLC	1
3.	Valve Manifold: a. L x W x H : 60 X 26.5 X 65 mm b. Grid spacing – 19 mm c. Mountable valve port size 1/8'' d. Provided with Conical silencers for reducing the dB level of exhausted air e. 5/2 Double solenoid pilot operated valve: Material- Extruded aluminium with anodized Finish Size – 1/8 '' Design – Spool type Pressure range – 2 – 10 bar Flow rate – 450 l / min Manual override- Resetting Fitted with 1/8'' flow control valve for varying the flow	1
4.	Filter Regulator Combination with Lubricator (FRL Unit) with pressure gauge and start up valve: a. Port size -1/4 inch b. Flow rate – 500 l/min c. Maximum supply pressure – 10 bar d. Operating pressure- 6 bar e. Filtering element grade – 40 µm f. Minimum operating flow – 12 l/min g. Filter Bowl capacity – 9 ml h. Lubricator Bowl capacity – 20 ml i. Connection for tube 8 dia input and 8 dia output j. Mounting – Socket head cap screw with M6 hammer head nut	1

S. No	Item with description	Qty
5.	Sorting Conveyor Module: a. Flat belt conveyor with overall length of 500mm Conveyor to be driven by 24V DC motor of reputed make Conveyor to be provided with electronic drive unit for regulating the speed, reversing the direction and other functions b. Comprising of 2 pneumatic cylinders of dia 25 mm and stroke 40 mm Sorting slides for collecting the work piece on appropriate slides c. Color Sensor: Sensing range: 15mm Supply Voltage and Current: 10 to 30V DC (10% max. ripple) Switch output: PNP, normally open/normally closed contact Output Protection: Protected against false pulse on power-up, short-circuit protected Output rating : 100 mA d. Proximity sensor: Type - Cylindrical inductive type Supply voltage -12 – 24V DC Sensing range – 8 mm e. Diffuse Sensor : Type : Infra red Sensing range: 15mm Supply Voltage and Current: 10 to 30V DC (10% max. ripple) @ 20 mA	1

	max current Switch output: PNP, normally open/normally closed contact Output Protection: Protected against false pulse on power-up, short-circuit protected	
6.	Control console: a. Cycle start push button –Green with illuminated b. Auto /Manual selector switch -Black c. Home position push button –Red with illuminated d. Emergency button -Red	1
7.	Cable duct and accessories: a. Wire duct size 45x25 b. Fastening screws	1
8.	PLC control panel with S7 1200 PLC: a. Power supply: Input voltage :230/115 V AC (47 – 63 Hz), Output voltage: 24 V DC ,short-circuit-proof Output current: Maximum 3A b. Miniature circuit breaker DC voltage with max.5A current rating c. Digital inputs-14,Digital outputs 10, Analog inputs 2Ethernet interface 1 x TCP/IP, 10 Mbit/s d. Terminal blocks e. 25pin D-sub I/O data cable length 1.5 m, wire used 0.25 mm2 f. Cable ducts g. Power Connection cable:3pin plug with length of 1.3m	1
9.	Technical documents for Process Station: Should contain complete technical details of the station according to DIN ISO 1219 standard. It should include Pneumatic circuit, Electrical circuit, IO list, Functional description etc.,	1

PLC software and accessories

a. PLC software should be supplied with floating license

b. PLC Software and Programming cable should be compatible with PLC used in the above stations for programming and real time communication

c. Programming software should support various programming languages like ST, FBD, Ladder etc.,

d. Ethernet cable should be supplied with the length of 2mtr for connecting PLC to PC for programming and other communications

Scope of supply

1.	PLC programming cable for connecting to PC	1
2.	PLC Programming software	1

1) Assembly Templates

Should contain assembly templates required for the assembly of respective station and for the different combination functions. It should be made up of plain anodized Aluminium sheet with with handle

2) Technical Document

Main technical document shall contain the details for the assembly of all the five stations in different combination functions. It shall include positional sketch and installation procedure etc.

3) Work Piece set

Should Contain 18 approved work pieces of diameter 40 mm and height 25 mm and 6 rejected work pieces of diameter 40 mm and height 23.5 in every material made of Aluminium / Delrin / Hylum.

NOTE:

1. In order to ensure that the FAT will be successfully and expeditiously completed, it shall commence only after the successful completion of a preliminary FAT (Pre-FAT). The intent is for the bidder to detect and

correct most design, integration and performance problems before the principal investigator come to the factory for the FAT. The Pre-FAT shall be supervised by the person designated to serve later as the bidder's inspector of the FAT and each test shall be formally signed off by that person. The signed off test results shall be sent to the principal investigator for review 01 week before the principal investigator came to bidder's factory for FAT

2. In order to ensure that the SAT will be successfully and expeditiously completed, it shall commence only after the successful completion of a preliminary SAT (Pre-SAT). The intent is for the bidder to detect and correct most design, integration and performance problems before the principal investigator come to the site for the SAT. The Pre-SAT shall be supervised by the person designated to serve later as the employer's inspector of the SAT and each test shall be formally signed off by that person. The signed off test results shall be sent to the principal investigator for review 01 week before the principal investigator came to site for SAT.
3. The system shall declare commissioned, when the system runs satisfactorily for a period of 3 days at site. If the system fails to perform for more than 1 hour, then the process is to be repeated again. This process should continue till the system gets commissioned.
4. Supplier shall supply 02 sets (hard-copy) of as-built drawings / maintenance manual.
5. Hands on training of development & configuration, operation & maintenance & trouble shooting aspects of the supplied system to be imparted for a period of 15 Man-Days before hand-over.
6. Supplier shall supply, at its own expense, all consumables required for use during installation & commissioning + through the warranty period.
7. All hardware shall be manufactured, fabricated, assembled, finished, and documented with workmanship of the highest production quality and shall conform to all applicable quality control standards of the original manufacturer and the bidder. All hardware components shall conform to latest products based on industry standard.
8. The specification contains minimum hardware requirement. However, the bidder shall provide hard ware with configuration equal or above to meet the technical, functional & performance requirement. Any hardware /software that are required to meet functional, performance & availability requirement shall be provided by bidder & the same shall be mentioned in the BOQ at the time of bid.
9. The proposed system shall be designed for an open & scalable configuration, to ensure the inter compatibility with other systems of the utility, the future smooth expansion as well as the easy maintainability.
10. Aluminium Profile table, valve manifold etc. with different dimensions are also acceptable

All the installation work is included

Terms & Conditions as per below mentioned link:

https://www.cse.iitk.ac.in/doc/Annexure1_General_rules_for_purchase_in_cse_20180205.pdf

Dr. Sandeep K Shukla PTO

Contact person:

Meeta Bagga
meeta@cse.iitk.ac.in Contact-
0512-259-6722 Mailing
Address:

RM-410, Rajeev Motwani Building

Department Of Computer Science & Engineering Indian
Institute of Technology