

Scope for Retrofitting of Mitsubishi T-Root Machining Center (Model No. K0501521)
Plan No. 2-421, TBM, BI-3, BHEL Hardwar

Brief About Machine : The machine comprises of six stations. Station no. 1 is Job Loading/ unloading station, Station 2 & 3 are manual machining stations which carry our pre-determined cycles in Auto mode controlled by limit switches. Stations 4, 5 & 6 are CNC controlled machining stations with 2 CNC controlled axes per station. Station no. 4 has two Spindle drives, Station no. 5 has one spindle drive & Station no. 6 has contactor controlled induction motor for spindle. All the stations can run independently in Cycle, Ref and Jog modes in Machine manual mode. In Automatic modes, the machine synchronizes and simultaneously starts the cycle of all the stations; On completion of cycle table indexes after clamping of next Job at station no. 1 and starts cycle once again automatically. Existing CNC System is of Fanuc 7M.

Sl. No	Description	Qty	Accepted (Yes/No)	Deviation	Remarks
1.	MATERIAL SUPPLY				
1.1	<u>CNC SYSTEM FANUC</u> latest FS 0i Model D comprising of the following features:	03 Nos.			<u>Vendor to comply</u>
a)	Milling configuration				<u>Vendor to comply</u>
b)	Oriented Spindle stop				<u>Vendor to comply</u>
c)	One RS232, USB & Ethernet port for data transfer				<u>Vendor to comply</u>
d)	Measuring system, lead screw, Backlash & Friction compensation				<u>Vendor to comply</u>
e)	Graphic simulation- Single sided 2D view, dynamic				<u>Vendor to comply</u>
f)	Ladder diagram / STL format should be provided. Ladder program should be editable on the monitor of CNC. Status of various signal should be indicated in ladder diagram				<u>Vendor to comply</u>
g)	CNC user memory for program and data should be 2MB.				<u>Vendor to comply</u>
1.1.1	Machine Operator panel for Mode selection, Feed override, Spindle override, (Auto, Edit, MDI, Remote, Ref return, Jog, Inc Jog, Single	03 Nos.			<u>Vendor to comply</u>

	Block, Block delete, Program Stop, Optional Stop, Restart, Dry Run, Machine lock. Cycle start, Cycle stop, Spindle Clock wise, SPDL CCW, SPDL Stop & 21 optional programmable key)				
1.1.2	Electronic Hand wheel & Handwheel interface (if required) on operator panel- One no. for each CNC station.	3 Sets			<u>Vendor to comply</u>
1.1.3	CF card for data transfer.	6 Nos.			<u>Vendor to provide details and comply</u>
1.1.4	Transcend make CF card reader. Interface cables for connecting CF card with PC and CNC system with PC through Ethernet & RS232 port.	3 Sets			<u>Vendor to provide details and comply</u>
1.1.5	Input/ Output board 96 input & 64 outputs (2 nos. per CNC station)	6 Nos.			<u>Vendor to provide details and comply</u>
1.1.6	12 Nos. X 8 Channel Relay boards per CNC station preferably Phoenix contact make should be provided for driving the PLC outputs to the machine. All PLC outputs to be routed to the machine through these Relay boards.	03 Sets			<u>Vendor to provide details and comply</u>
1.1.7	Existing RELAYs & TIMERs have to be removed but the relay logic has to be retained in new PLC program & electrical scheme.				<u>Vendor to comply</u>
1.1.8	All Software along with communication cables for data back-up & restoration.	01 No.			<u>Vendor to provide details and comply</u>
1.2.	<u>AC SERVO MOTORS FOR CNC CONTROLLED AXES & SPINDLE MOTORS FOR 4TH (2 Nos.) & 5TH STATION (1 No.)</u>				
1.2.1.	FANUC ai AC servo motor AC servo motor of suitable rating for Y axis with rated Torque (Mn) of 30 Nm and RPM equal to or more than 3000 RPM. (1 no. for each CNC station) Existing motor details are as under: GETTYS Fanuc Permanent Magnet DC Servo Motor Model 20 Type: A06B-0602-B021 Torque (Continuous) :23 Nm Stall Ampere (Continuous) at Stall : 33 amp	03 Nos.			<u>Vendor to provide details and comply</u>
1.2.2.	FANUC ai AC servo motor with holding brake for Z axis with rated	03 Nos.			<u>Vendor to provide</u>

	<p>Torque (Mn) of 30 Nm and RPM more equal to 3000 RPM. (1 no. for each CNC station)</p> <p>Pls. note Z axis is fitted with mechanical counterbalance.</p> <p>Existing motor details are as under: GETTYS Fanuc Permanent Magnet DC Servo Motor Model 20 Type: A06B-0602-B221 Torque (Continuous) :23 Nm Stall Ampere (Continuous) at Stall : 33 amp</p>				<u>details and comply</u>
1.2.3	<p>Suitable FANUC oil Spindle Motor (Air cooled) with 7.5 KW or more rated Power & maximum RPM (both Base & Top speed) more than or equal to existing motor. Size constraints for the motor have to be accounted for considering the available space in the machine (For 4th station- 2 Nos.). Both motors have to run at same speed and are to be controlled by single Spindle command.</p> <p>Existing motor details are as under: Mitsubishi Electric make DC Motor Super line Type: SF-E, JIS-C_4004 Frame: 132L Power: 6 KW, 4 Poles 1150/ 3500 RPM with Blower Fan; Field current: 5.1/ 1.3 Amps</p>	02 Nos.			<u>Vendor to provide details and comply</u>
1.2.4	<p>Suitable FANUC oil Spindle Motor (Air cooled) motor with 15 KW or more rated Power & Maximum RPM 7000 (both Base & Top speed) more than or equal to existing motor. Size constraints for the motor have to be accounted for considering the available space in the machine (For 5th station- 1 No.)</p> <p>Existing motor details are as under: Mitsubishi Electric make DC Motor Super line Type: SF-E, JIS-C_4004 Frame: 160L Power: 12KW, 4 Poles 1150/ 3500 RPM with Blower Fan; Field current: 7.2/ 2.1 Amps</p>	01 No.			<u>Vendor to provide details and comply</u>
1.2.5	<p>Supply of intermediate flanges, couplings and any other parts required for mounting of the Axes AC Servo motors (6 Nos.) and Spindle motors (3 Nos.).</p>	01 Set			<u>Vendor to provide details and comply</u>

1.3.	<u>AC SERVO DRIVES & SPINDLE DRIVES</u>				
	FANUC make AC Servo drive for Feed motor control with input voltage of 200 VAC (+/- 10%), 3 phase 3 wire system.				<u>Vendor to comply</u>
1.3.1	AC Line Filter with appropriate rating (1 Set for each CNC station). Maximum ratings of motors offered to be taken into account for calculating the ratings of the Module.	03 Sets.			<u>Vendor to provide details and comply</u>
1.3.2	Suitably rated FANUC Double Motor Module (for Y & Z axis motor) -1 Set for each CNC station.	03 Sets.			<u>Vendor to provide details and comply</u>
1.3.3	Suitably rated FANUC Single Line module (For 4 th Station spindle motors- 2 Nos.).	02 Nos.			<u>Vendor to provide details and comply</u>
1.3.4	Suitably rated FANUC Single Line module (For 5 th station spindle motor- 1 No.)	01 No.			<u>Vendor to provide details and comply</u>
1.3.5	Controller card for Y, Z & Spindle (If required)- 1 Set for each CNC station	03 Sets.			<u>Vendor to provide details and comply</u>
1.3.6	Encoder cables of suitable length for all the six AC Servo motors & three Spindle motors for CNC stations	01 Set			<u>Vendor to provide details and comply</u>
1.3.7	Power cables of suitable length and type for all the six AC Servo motors & three Spindle motors for CNC stations. Please note that Y axis motors are without holding brake & Z axis motors are having holding brake.	01 Set			<u>Vendor to provide details and comply</u>
1.3.8	Shield terminal plates and earthing schematic for all the modules	01 Set			<u>Vendor to provide details and comply</u>
1.3.9	Pre-assembled cables to connect a laptop with the drives for commissioning and diagnosis purposes	01 Set			<u>Vendor to provide details and comply</u>
1.3.10	Servo Tuning card Drives commissioning software on CD (Licensed copy) along with interface cables	01 Set			<u>Vendor to provide details and comply</u>
1.4	<u>MEASURING SYSTEM</u>				
1.4.1	The existing Y-axis & Z axis motor resolver has to be replaced with in-built motor encoder. The existing resolver is Tamagawa make Type TS530N33E9. The Laser Calibration & setting of pitch error/ backlash compensation of both the	.			<u>Vendor to provide details and comply</u>

	axes shall be in the scope of work. (If required)				
1.5.	<u>PLC FEATURES</u>				
1.5.1	6 th Station CNC system will be Master CNC system to control PLC requirement of Main operator panel and 1 st , 2 nd , 3 rd station & Table function.				
1.5.1.1	Indexing table scheme and functioning as per existing relay logic.				<u>Vendor to comply</u>
1.5.1.2	Complete Machine ON functions like Emergency stop of all stations including CNC and non-CNC stations, Ready etc. as per existing logic				<u>Vendor to comply</u>
1.5.1.3	Control of auxiliary functions and generation of necessary annunciations like Hydraulic, Coolant, Chip conveyor, Slides and Table Lubrication etc. as per existing logic.				<u>Vendor to comply</u>
1.5.1.4	Control of Cycle start of all stations in Auto mode.				<u>Vendor to comply</u>
1.5.1.5	Control of all manual stations i.e. 1 st (Loading/ Unloading station), 2 nd and 3 rd (both are machining stations) stations in their manual and automatic modes as per existing logic.				<u>Vendor to comply</u>
1.5.1.6	Interlocking of all safety features related to all 6stations (CNC as well as non-CNC)				<u>Vendor to provide details and comply</u>
1.5.1.7	Signal transfer with CNC stations as per existing logic.				<u>Vendor to provide details and comply</u>
1.5.1.8	Incorporation of any other common logic for functioning of the machine as available presently.				<u>Vendor to provide details and comply</u>
1.5.1.9	All existing relays and timers to be removed from the circuit and their logic to be incorporated in the PLC program				<u>Vendor to comply</u>
1.5.1.10	The logic of the CNC stations (4 th , 5 th & 6 th stations) to be managed in the in-built PLC in their respective CNC systems with interface signals to 6 th Station CNC as required by logic of the machine.				<u>Vendor to provide details and comply</u>
1.5.2	PLC has to be provided with 96 Inputs and 64 outputs. In case the vendor perceives that more Inputs/ Outputs are required for completion for the work as per their designed and conceived electrical scheme, the same should be included in the scope of supply. All outputs to be routed through Phoenix contact make relay boards	02 Set			<u>Vendor to provide details and comply</u>

1.5.3	12 Nos. X 8 Channel Relay boards preferably Phoenix contact make should be provided for driving the PLC outputs to the machine. All PLC outputs to be routed to the machine through these Relay boards. Additional I/O board	01 Set			<u>Vendor to provide details and comply</u>
1.5.4	AC INDUCTION MOTORS: All three phase AC induction motors & lubrication pumps are to be replaced with equivalent ones with respect to mounting and ratings of Siemens make. The ratings & details of the motors & lubrication units to be replaced is given below:				<u>Information to the Vendor</u>
1.5.4.1	Hydraulic pump motor to be replaced. Existing Hydraulic pump motor details are as below: 3 phase induction motor, Superline 5.5 KW, Type: ST-F, Rating: Continuous, Frame: 132M, 415 V, 12 A, 950 rpm, 50 Hz	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.2	Oil matic pump motor to be replaced. Existing Oil-matic (cooler for Hydraulic pump) motor details are below: 3 phase induction motor, 4 pole, Nippon Gerotor 0.4 KW, Type: FELQ-8T JISC 4210, Rating: Continuous, Rotor: C, 415 V, 1720 rpm, 50 Hz	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.3	Coolant pump motor to be replaced. Existing Coolant pump motor details are below: 3 phase induction motor, 6 pole, Superline 7.5 KW, Type: SF-F, Rating: Continuous, Frame: 160M, 415 V, 17 A, 900 rpm, Bearing: 6309ZZ and 6308ZZ, Rotor: K2, 50 Hz	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.4	Chip conveyor motor to be replaced. Existing Chip Conveyor motor details are: 3 phase induction motor, 4 pole, Yasakawa 0.4 KW, Type: FELQ-7, Rating: Continuous, 415 V, 0.97 A, 1420 rpm, Rotor: C, Bearing: 4202ZZ, 50 Hz	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.5	Table lubrication motor to be replaced. Existing Table lubrication motor details are: 3 phase induction motor, 4 pole, Superline 0.2 KW, Type: SF-ER, Rating: Continuous, Frame: 132M, 415 V, 0.65 A, 1430 rpm, 50 Hz	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.6	Slide lubrication motor to be replaced. Existing Slide lubrication motor	01 No.			<u>Vendor to provide</u>

	<p>details are: 3 phase induction motor, 2 pole, Willy Vogel, Type: 900178301, Rating: Continuous, 415 V, 0.24 A, 2700 rpm, 50 Hz</p>				<u>details and comply</u>
1.5.4.7	<p>Spindle gear box lubricating pump motor for third station (2 nos.) and sixth station (1 nos.) to be replaced. Existing Spindle gear box lubricating pump motor for third station (2 nos.) and sixth station (1 nos.) details are: 3 phase induction motor, 4 poles, Trochoid Pumps 75 W, Type: HT-NR, Rating: Continuous, 415 V, 0.32 A, 1400 rpm, 50 Hz, Rotor: C, Bearing: 6202 and 6200</p>	03 No.			<u>Vendor to provide details and comply</u>
1.5.4.8	<p>Table motor to be replaced. Existing Table motor details are: 3 phase induction motor, 6 poles, Superline 3.7 KW, Type: SF-E Rating: Continuous, Frame: 132S, 415 V, 8.5 A, 950 rpm, 50 Hz, with inbuilt brakes, motor JP44 brake JP20, Bearing: 6210ZZ & 6307ZZ, Braking torque above 150%</p>	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.9	<p>Second station Spindle motor to be replaced. Existing Second station Spindle motor details are: 3 phase induction motor, 4 poles, Superline 11KW, Type: SF-E, Rating: Continuous, Frame: 160M , 415 V, 21 A, 1430 rpm, 50 Hz, Rotor: K2, Bearing: 6309ZZ and 6308ZZ</p>	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.10	<p>Second station Column tilting motor to be replaced. Existing Second station Column tilting motor details are: 3 phase induction motor, 4 poles, Superline 0.75 KW, Type: SF-E, Rating: Continuous, Frame: 90L , 415 V, 2.4 A, 950 rpm, 50 Hz, Bearing: 6205ZZ and 6204ZZ</p>	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.11	<p>Second station Column feed motor to be replaced. Existing Second station Column feed motor details are: 3 phase induction motor, 4 poles, Superline 4 KW, Type: SF-EF, Rating: Continuous, Frame: L5-100L , 415 V, 4.7 A, 950 rpm, 50 Hz, Bearing: 6206ZZ and 6205ZZ</p>	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.12	<p>Third station Spindle motor (Left & Right) to be replaced. Existing Third station Spindle motor (Left & Right) details are: 3 phase induction motor, 6 poles, Superline 7.5KW, Type: SF-E, Rating:</p>	02 No.			<u>Vendor to provide details and comply</u>

	Continuous, Frame: 160M , 415 V, 17 A, 960 rpm, 50 Hz, Rotor: K2, Bearing: 6309ZZ and 6308ZZ				
1.5.4.13	Third station Head Feed motor (Rapid) to be replaced. Existing Third station Head Feed motor (Rapid) details are: 3 phase induction motor, 6 poles, Superline 3.7KW, Type: SF-E, Rating: Continuous, Frame: 132S , 415 V, 8.5 A, 1430 rpm, 50 Hz, Rotor: C, Bearing: 6208ZZ and 6307ZZ	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.14	Third station Head Feed motor (Cutting Feed) to be replaced. Existing Third station Head Feed motor (Cutting Feed) details are: 3 phase induction motor, 4/8 poles, Superline 2.2KW, Type: SF-E, Rating: Continuous, Frame: 112M , 415 V, 4.3 A, 1440 rpm, 50 Hz, Bearing: 6207ZZ and 6206ZZ	01 No.			<u>Vendor to provide details and comply</u>
1.5.4.15	Sixth station Spindle motor to be replaced. Existing Sixth station Spindle motor details are: 3 phase induction motor, 4 poles, Superline 5.5 KW, Type: SF-E, Rating: Continuous, Frame: 132S , 415 V, 11.54 A, 1440 rpm, 50 Hz, Rotor: K2, Bearing: 6208ZZ and 6209ZZ	01 No.			<u>Vendor to provide details and comply</u>
1.6	<u>ELECTRICAL FEATURES</u>				
1.6.1	Operator Panels for all CNC stations should be aesthetic & with the following features: a) Floor mounted of suitable height b) Height of the operator panel & display to be suitable for person of average height (5'5") c) Fitted with suitable air conditioner d) Swivel of minimum 180 degrees e) Front side should have two side handles for rotating by hand f) The rear door should be on hinges and not screw mounted g) Illumination light with switch for working in the operator panel h) 220 VAC/ 5 Amp 3-pin service socket and switch	03 Nos.			<u>Vendor to provide details and comply</u>
1.6.2	New electrical cabinet with suitable air-conditioner to be supplied for the electrical items including Drives, LV switchgear etc. The maximum panel	01 Set			<u>Vendor to provide details and comply</u>

	height should be 2 meters. Therefore the Electrical cabinet should be dust & vermin proof. No elements should be mounted on the back-side of the panel.				
1.6.3	The operator panels of CNC stations, CNC cabinets & Electrical cabinets are to be removed. The main common operator panel, 1 st , 2 nd and 3 rd station operator panels are to be retained. Vendor to provide 100 nos. indicating lamp 24V/ 2W of the type used on the machine (Existing lamps are wired to 16 V supply and are 2W) and rewire the above with new lugs, ferrules and conduits as required.	01 Set			<u>Vendor to provide details and comply</u>
1.6.4	L&T/Siemens/ABB/ Schneider Electric make MCCB with rotary handle kit of appropriate rating as per the new scheme (25% over-rated to maximum load) for switching on the power supply of panel & machine to be mounted at operator height on the right side of panel.	01 No.			<u>Vendor to provide details and comply</u>
1.6.5	Suitable Semiconductor, HRC fuses, fuse bases of GE/ SIEMENS/ BUSSMAN make for overload protection.	02 Sets			<u>Vendor to provide details and comply</u>
1.6.6	The complete LV switchgear of the machine including overloads, relays, contactors, MCBs, MPCBs etc. is to be supplied & interfaced by the vendor as per existing scheme. Vendor must interface each induction motor with MPCB for single phase and overload protection.	01 Set			<u>Vendor to provide details and comply</u>
1.6.7	Electrical Cabinet to be equipped with a) Door limit switch operated panel tube lights with by-pass switch b) 15 Amp 3-pin service socket and switch	02 Nos.			<u>Vendor to provide details and comply</u>
1.6.8	Additional Keys, Push-buttons, Indicator lamps/ lamp holders& Selector switches required on the operator panel for operation of the machine to be provided by the vendor	01 Set			<u>Vendor to provide details and comply</u>
1.6.9	DC Regulated Power Supply 24V DC, 40 Amps of Siemens/Phoenix/M-System	02 Nos.			<u>Vendor to provide details and comply</u>
1.6.10	DC Regulated Power Supply 24V DC, 10 Amps of Siemens/Phoenix/M-System	04 Nos.			<u>Vendor to provide details and comply</u>
1.6.11	Sealed machine light of reputed make having halogen lamp (Minimum 70 W)/ Sealed tube-light (220 V AC/24VDC) to be installed.	06 Nos.			<u>Vendor to provide details and comply</u>
1.6.12	Wires for rewiring of the entire machine including Control, signal & Power				<u>Vendor to provide</u>

	cabling (including Cabling to Spindle & feed motors). Supply to the machine will be provided by BHEL. The vendor to note that the entire machine has to be rewired.	01 Set			<u>details and comply</u>
1.6.13	Vendor should provide the proposed electrical schematic along with bill of material to BHEL for approval prior to dispatch.				<u>Vendor to provide details and comply</u>
1.6.14	Terminal boxes, screwed terminal blocks, bus bars, transformers etc. as required per the new electrical scheme should be provided of reputed makes viz. Wago, Phoenix contact etc.	01 Set			<u>Vendor to provide details and comply</u>
1.6.15	Vendor must supply 415V/100V transformer of 2KVA rating of reputed make. The solenoid valves used on the machine are with 100V AC coil voltage and the same are to be retained.	02 Nos.			<u>Vendor to provide details and comply</u>
1.6.16	4 colored signal light display (LED type) should be interfaced with PLC to show the operational status of the machine and visible from a distance.	06 Nos.			<u>Vendor to provide details and comply</u>
1.6.17	Terminal boxes, screwed terminal blocks, bus bars, transformers etc. as required per the new electrical scheme should be provided of reputed makes viz. Wago, Phoenix contact etc.				<u>Vendor to provide details and comply</u>
1.6.18	All existing Limit switches, pressure switches, flow switches are to be replaced with digital variants for pressure/ flow switches& Limit switches of reputed make. All the above shall be replaced with 24 VDC based elements from reputed make manufacturers.				
1.7	<u>OTHER FEATURES</u>				
1.7.1	Design and supply of intermediate flanges, couplings and any other parts required for mounting of AC Servo motors (6 Nos.) & Spindle motors (3 Nos.).	01 Set			<u>Vendor to provide details and comply</u>
1.7.2	Set of keys for Electrical cabinet & Operator Panel locks	03 Sets			<u>Vendor to comply</u>
1.7.3	Lapp make hose pipes, DIN rails (5 meters), cable ducts (5 meters), insulated lugs(0.5, 1.0, 1.5 sq. mm 200 nos. each & 2.5, 4.0 sq. mm 100 nos. each), printed ferrules (0-9 of 1.0 & 1.5 sq. mm 200 each and A-Z of 1.0 & 1.5 sq. mm 100 each) and other material required for the wiring of Machine, Electrical & Operator panels.	01 Set			<u>Vendor to provide details and comply</u>
1.7.4	Party shall supply all clamps, fixtures and fasteners required to complete	01 Set			<u>Vendor to comply</u>

	the job.				
1.7.5	Any other material not mentioned above but found necessary to complete the job, shall be in party's scope of supply	01 Set			<u>Vendor to comply</u>
2.	<u>COMMISSIONING:</u>				
	Party shall undertake commissioning of the supplied components at BHEL, Hardwar. All material required for commissioning of the system with the machine shall be supplied by the party free of cost and obligation. All commissioning materials shall be supplied by party.				<u>Vendor to comply</u>
3.	<u>ACCEPTANCE:</u>				
3.1	Party shall demonstrate operation of all parts of the system supplied along with all the features as specified above.				<u>Vendor to comply</u>
3.2	Demonstration of seamless running of already existing programs (compatible with earlier Fanuc 7M CNC system) without any modification through machining of two types of blades (5 nos. each for Guide & Moving blades). The blank raw material, tooling, fixture & existing programs for machining of the blades will be provided by BHEL.				<u>Vendor to comply</u>
3.3.	Final Acceptance shall be at BHEL, Hardwar after successful commissioning, testing of the supplied system for all operations and successful machining of two types of blades (5 nos. each for Guide & Moving blades) with earlier existing programs as per para no. 3.2.				<u>Vendor to comply</u>
4.	<u>DELIVERY: (If delivery period is not offered / acceptable, offer will be rejected)</u>				
4.1	Material: 6 months from the date of release of work order. Early delivery will be acceptable.				<u>Vendor to comply</u>
4.2	Work : 10 weeks from date of release of machine for work.				<u>Vendor to comply</u>
5.	<u>DOCUMENTATION</u>				
	Following documents shall be supplied by the Party:				
5.1	CNC system manuals in hard copy comprising of Installation & Start-up				<u>Vendor to provide</u>

	guide, Connecting conditions, Configuration guide, Diagnostics guide, Commissioning guide	03 Sets			<u>details and comply</u>
5.2	Programming Manuals	02 Sets			<u>Vendor to provide details and comply</u>
5.3	Technical and Service manuals of the AC servomotors & Spindle motors in hard copy.	03 Sets			<u>Vendor to provide details and comply</u>
5.4	Commissioning and service manuals of the AC servo drive & Spindle drives	03 Sets			<u>Vendor to provide details and comply</u>
5.5	Commissioning and service manuals of the PLC	02 Sets			<u>Vendor to provide details and comply</u>
5.6	PLC program hard copy with comments & cross-reference list	03 Sets			<u>Vendor to provide details and comply</u>
5.7	PLC program on CD in installable & printable formats	01 Set			<u>Vendor to provide details and comply</u>
5.8	New electrical schematic of the machine	03 Sets			<u>Vendor to provide details and comply</u>
5.9	Instructions for data back-up & restoration for CNC & PLC	03 Sets			<u>Vendor to provide details and comply</u>
5.10	All documentation, CNC, Spindle & Feed Drive parameters & back-up on CD	01 Set			<u>Vendor to provide details and comply</u>
5.11	Documentation of all bought-out items	03 Sets			<u>Vendor to provide details and comply</u>
6.	<u>SPARES:</u> (To be compulsorily quoted otherwise offer will be rejected)				
6.1	Active Line Module with Line filter and HF commutating choke of appropriate rating (1 Set for each CNC station) of the highest rating used on the machine.	01 Set			<u>Vendor to provide details and comply</u>
6.2	Double Motor Module (for Y & Z axis motor).	01 No.			<u>Vendor to provide details and comply</u>
6.3	Single Line module (For 4 th Station spindle motors).	01 No.			<u>Vendor to provide details and comply</u>

6.4	Single Line module (For 5 th station spindle motor)	01 No.			<u>Vendor to provide details and comply</u>
6.5	Y-axis motor	01 No.			<u>Vendor to provide details and comply</u>
6.6	Z axis motor	01 No.			<u>Vendor to provide details and comply</u>
6.7	Complete CNC control	01 No.			<u>Vendor to provide details and comply</u>
7.	<u>WARRANTY:</u>				
	Party shall stand warranty for all the supplied material and work executed for a period of one year from the date of successful commissioning of the machine at BHEL, Haridwar.				<u>Vendor to comply</u>
8.	<u>TRAINING:</u>				
8.1	Party shall impart training to BHEL staff, for operation, programming & maintenance of the system supplied by them during installation & commissioning.				<u>Vendor to provide details and comply</u>
8.2	Vendor to arrange one week's training each for Maintenance & commissioning, Programming & Operating of CNC system at CNC System manufacturer's works				<u>Vendor to provide details and comply</u>
9.	<u>VENDOR'S OBLIGATION:</u>				
	The vendor shall bring all tools, tackles and testing equipment with them for successful commissioning of supplied system.				<u>Vendor to comply</u>
10.	<u>QUALIFYING CONDITIONS</u>				
10.1	The average annual turnover during the last three years ending March 31 st 2011 should be at least ₹ 32 Lac . Audited balance sheets for the last three years should be submitted.				<u>Vendor to provide details & comply</u>
10.2	Banker's Solvency from any nationalized / scheduled bank valid on the date of opening of tender.				<u>Vendor to provide details & comply</u>

10.3	<p>The Vendor must have successfully retrofitted CNC machines with Fanuc CNC system during last seven years ending 31st Dec'2011 and should be either of the following:</p> <p>a). Three no. of CNC machines retrofitted with Fanuc CNC system with project costing not less than ₹ 43 Lacs. OR</p> <p>b). Two no. of CNC machines retrofitted with Fanuc CNC system with project costing not less than ₹ 53 Lacs. OR</p> <p>c). One no. of CNC machines retrofitted with Fanuc CNC system with project costing not less than ₹ 85 Lacs.</p> <p>The above retrofitted machines should be running satisfactorily for at least 6 months prior to 31st Dec'2011. Vendor to provide P.O. copies and performance certificates for satisfactory operation of the above retrofitted systems along with name, address & contact details of their customer. BHEL reserves the right to verify the information provided.</p>				<u>Vendor to provide details & comply</u>
11.	<u>LIQUIDATED DAMAGES (LD) CLAUSE:-</u>				<u>Vendor to comply</u>
11.1.	LD @ ½% per week subject to a max. of 5% of the order value shall be applicable for delay in deliveries. Vendor should intimate regarding PDI 7 days in advance only. The time period from invitation date for Pre dispatch inspection from vendor to the date of arrival of Pre Dispatch Team to vendor's works and any other reasons attributed to BHEL will not be accounted for in delivery period. This period will be excluded for the purpose of calculating Liquidated damages.				<u>Vendor to comply</u>
11.2.	Liquidated damages @ 2% per week subject to a max. of 10% of the Commissioning Charges shall be applicable for delay beyond scheduled commissioning date (which will be 10 weeks from date of release of machine for work) for reasons attributed to the party. Net delay for the purpose of calculating liquidity damages will be considered as the delay				<u>Vendor to comply</u>

	in commissioning.				
12.	<u>PRE-DISPATCH INSPECTION</u>				<u>Vendor to comply</u>
12.1	Pre-dispatch inspection of all the items covered under Scope of Supply at para (1) and spares at para (6) shall be carried out by BHEL personnel at party's works.				<u>Vendor to comply</u>
12.2	Supplier shall invite BHEL for carrying out pre- inspection.				<u>Vendor to comply</u>
12.3	Deputed BHEL persons shall do pre acceptance at vendor works and give despatch clearance.				<u>Vendor to comply</u>
12.4	Expenses of Boarding and lodging of BHEL personnel during PDI shall be borne by BHEL.				<u>Vendor to comply</u>
13.	<u>SUBMISSION OF BILL OF MATERIAL (BOM)</u>				<u>Vendor to comply</u>
	Before inviting BHEL for Pre-dispatch inspection, vendor shall submit to BHEL the Bill of Material (BOM) and proposed electrical drawing/ schematic for scrutiny.				<u>Vendor to comply</u>
14.	<u>EARNEST MONEY DEPOSIT (EMD):</u>				<u>Vendor to comply</u>
14.1	Vendors have to deposit ₹ 2,00,000 as EMD. EMD may be deposited in cash, through pay order in favor of BHEL, Hardwar or through demand draft only. The rate of EMD will be as below:				<u>Vendor to comply</u>
14.2	EMD shall be converted to security deposit if the work is awarded.				<u>Vendor to comply</u>
14.3	EMD of unsuccessful bidders shall be refunded back normally within fifteen days of acceptance of award of work by the successful bidder.				<u>Vendor to comply</u>
14.4	EMD shall not carry any interest.				<u>Vendor to comply</u>
14.5	EMD by bidder will be forfeited as per tender document, if				<u>Vendor to comply</u>
14.5.1	After opening the tender, the tenderer revokes his tender within the validity period or increases his earlier quoted rates				<u>Vendor to comply</u>
14.5.2	The tenderer does not commence the work within the period as per LOI/contract.				<u>Vendor to comply</u>
14.6	Offers without EMD will be rejected and will not be considered for evaluation.				<u>Vendor to comply</u>

15.	<u>SECURITY DEPOSIT (SD):-</u>				<u>Vendor to comply</u>
15.1	Successful vendor shall deposit security. The rate of security deposit will be as below:				<u>Vendor to comply</u>
	• For work Up to ₹ 10 Lakhs : <u>10% of work order value</u>				<u>Vendor to comply</u>
	• Above ₹ 10 Lakhs upto ₹ 50 Lakhs : <u>₹ 1 Lakh + 7.5% amount exceeding ₹ 10 Lakhs</u>				<u>Vendor to comply</u>
	• Above ₹ 50 Lakhs: <u>₹ 4 Lakhs + 5% amount exceeding ₹ 50 Lakhs</u>				<u>Vendor to comply</u>
15.2	The security deposit should be submitted before the start of work in the following forms:				<u>Vendor to comply</u>
	i) Cash (As permissible under the Income Tax Act)				<u>Vendor to comply</u>
	ii) Pay Order, Demand Draft in favour of BHEL, Hardwar				<u>Vendor to comply</u>
	iii) Local cheques of Scheduled Banks, subject to realization.				<u>Vendor to comply</u>
	iv) Bank Guarantee from Scheduled Banks/Public Financial Institution as defined in the companies Act. The Bank guarantee format should have the approval of BHEL.				<u>Vendor to comply</u>
15.3	Security Deposit shall not carry any interest.				<u>Vendor to comply</u>
15.4	EMD of successful tenderer can be converted and adjusted against the Security Deposit.				<u>Vendor to comply</u>
15.5	100% of the Security Deposit amount shall be refunded to the vendor after post commissioning successful running of the machine for one month. SD shall be released after the submission of Performance Bank Guarantee(PBG) by the vendor				<u>Vendor to comply</u>
16.	<u>PERFORMANCE BANK GUARANTEE (PBG):-</u>				<u>Vendor to comply</u>
16.1	Vendor shall be required to submit a performance bank guarantee(PBG) for 10% of the total work order value which shall be valid for a period of 12 months from the date of commissioning.				<u>Vendor to comply</u>
16.2	The PBG shall be submitted on a non-judicial stamp paper of value not less than Rs.80/- issued by any one of the nationalised banks.				<u>Vendor to comply</u>

17.	<u>PAYMENT TERMS:</u> (Note : No advance payment shall be made to the vendor.)				<u>Vendor to comply</u>
17.1	Part payment will be made after completion of following milestones				<u>Vendor to comply</u>
17.1.1	First payment of 80% of material cost along with 100% taxes & duties shall be payable after inspection & acceptance of material at BHEL, Haridwar. Vendor to ensure that all relevant documents are submitted.				<u>Vendor to comply</u>
17.1.2	Final payment of balance 20% of material cost, 100% of commissioning cost and refund of 100% of the Security Deposit amount will be made after post commissioning successful running of the machine for one month, subjected to submission of PBG as per “ Para 16 ”				<u>Vendor to comply</u>
17.2	All the payments shall be made through e-payment after submission of following documents along with first bill.				<u>Vendor to comply</u>
17.2.1	E-payment form duly filled (Form will be provided by BHEL)				<u>Vendor to comply</u>
17.2.1	Income tax exemption letter(if applicable)				<u>Vendor to comply</u>
17.3	Excise duty & CST/VAT will be paid on material cost and service tax will be paid on commissioning charges at actual. Related original documents to be submitted for availing MODVAT credit by BHEL.				<u>Vendor to comply</u>
18.	<u>Risk Purchase Clause</u> : In case of delays in supplies / defective supplies or non-fulfilment of any other terms & conditions given in the work order the purchaser may cancel the work order in full or part thereof and may also make the purchase of the material / service from elsewhere / alternative source at the risk and cost of supplier. Vendor does not agree to above clause, their offer is liable to be rejected. In case any vendor accepts risk purchase clause initially and subsequently declines to honour the term in the eventuality of RISK PURCHASE, they may be banned for business with BHEL.				<u>Vendor to comply</u>
19.	<u>GENERAL CONDITIONS:</u>				
19.1	A point wise compliance statement shall be submitted by the party with reference to the above scope of supply against each clause/ sub-clause with relevant details & comments. Non-compliance to any of the clauses				<u>Vendor to comply</u>

	& quoting inadequate quantity can lead to dis-qualification of the offer.				
19.2	The Vendor is advised to inspect the machine & collect sample existing machining programs (compatible with existing Fanuc 7M system) to ascertain all the relevant details required for successful completion of the work.				<u>Vendor to comply</u>
19.3	The proposed electrical schematic & Bill of Material for the machine shall be provided by the vendor prior to pre dispatch inspection.				<u>Vendor to comply</u>
19.4	Complete specifications such as part no./Model/Type, power, torque, Rated and maximum RPMs, Rated and maximum currents of the motor and drive controllers shall be stated in the offer by the party. Ordering brochure/catalogue should be attached.				<u>Vendor to comply</u>
19.5	Vendor must quote the quantity exactly as per the Scope of supply. No reduction in quantity as per the above Scope of supply is permissible.				<u>Vendor to comply</u>
19.6	Vendor must quote the Spare parts individually priced along with the offer otherwise the offer will be rejected.				<u>Vendor to comply</u>
19.7	The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com				<u>Vendor to comply</u>
19.8	The award of works will be made on the basis of the total of material cost (including spare parts) & commissioning charges				<u>Information to vendor</u>
19.9	The Vendor should submit their best price at this stage itself and they will not be allowed to revise the price. Any revision / discount given by the vendor subsequently will be ignored.				<u>Information to vendor</u>
19.10	Check List as per Annexure 'C' must be enclosed with techno-commercial bid				<u>Vendor to comply</u>
20.	<u>BHEL'S OBLIGATION:</u>				
20.1	Existing electrical schematic of the machine shall be provided by BHEL to the vendor.				<u>Vendor to comply</u>
20.2	Crane facility and lifting tackles like slings, rope, D-Shackles shall be				<u>Vendor to comply</u>

	provided.				
20.3	Any machining facility required for rectification/fitting of supplied material, subject to the extent available in BHEL, shall be provided.				<u>Vendor to comply</u>
20.4	Any civil work required for the erection of panel shall be done by BHEL.				<u>Vendor to comply</u>
20.5	Electricity, water, fasteners, welding sets, Gas cutting equipment, general purpose welding rods and holders required during commissioning shall be provided.				<u>Vendor to comply</u>
21.	<u>OFFER :-</u> The offer should be submitted in two parts and in following manner.				
21.1	<u>Techno-commercial Bid :</u>				
21.1.1	The envelop shall contain the Techno-commercial Bid (<u>ANNEXURE 'A'</u>) with technical details and commercial terms & conditions along with relevant documents like copies of ESI, PF code, PAN No., Service Tax Regn. No., TIN No., CST No., Experience Certificates, Audited Balance Sheet of last 3 years, <u>EMD</u> and Check List as per <u>ANNEXURE 'C'</u>				<u>Vendor to comply</u>
21.1.2	The envelop shall be super scribed with "Techno-Commercial Bid", Name of work & NIT No.				<u>Vendor to comply</u>
21.1.3	Point-wise compliance of this scope of supply and work is to be given by vendors while submitting their techno-commercial offer.				<u>Vendor to comply</u>
21.2	<u>Price Bid :</u>				
21.2.1	The second envelope shall contain only the price bid with separate price for material & work on Price Bid Format as per <u>ANNEXURE 'B'</u> .				<u>Vendor to comply</u>
21.2.2	Any other information in the price bid shall not be considered and the quotation is likely to be rejected. Price bid document shall be signed by the bidder at the bottom of the page.				<u>Vendor to comply</u>
21.2.3	The envelope shall be sealed and super scribed with "Price Bid", Name of work & NIT No.				<u>Vendor to comply</u>
21.2.4	Price bids of techno commercially accepted vendors shall be opened.				<u>Vendor to comply</u>
21.3	Both the above two envelopes shall be kept in another sealed cover. The cover shall be super-scribed with "Quotation for (name of work), NIT No. &				<u>Vendor to comply</u>

	due date and shall be addressed to Shri Brajendra Kumar, Manager (WEX-MCR), Block-6 Annexe, HEEP, BHEL, Haridwar-249403 and it should also contain Bidder address.				
22.	COMMERCIAL TERMS:				
22.1	Prices shall be quoted on “Firm Price” basis only. The prices should be on F.O.R BHEL, Haridwar basis inclusive of Packing & Forwarding, transit insurance & Transportation charges. Applicable % of ED & Sales Tax, Installation/ Commissioning Charges & Service Tax should be clearly indicated in attached Price bid format as per “ Annexure B ”				<u>Vendor to comply</u>
22.2	Validity of offer shall be for a minimum period of 120 days from the date of Tender Opening.				<u>Vendor to comply</u>
22.3	Freight & transit insurance charges from Dispatching station to BHEL, Haridwar shall be borne by the party.				<u>Vendor to comply</u>
22.4	The material will be dispatched to Central Plant Stores, HEEP, BHEL, Haridwar with instructions to forward the same to Manager (WEX-MCR), Block-6 Annexe, HEEP, BHEL, Haridwar-249403				<u>Vendor to comply</u>
23.	PACKING:				
	Supplier shall arrange for adequate protection and packing of the consignment so as to avoid loss and damage during transit and also take appropriate measures to prevent metal parts from rusting and corrosion during transit. Handling instructions shall be clearly printed /painted on the packages. Each package should carry a detailed packing slip. Supplier shall be responsible for any loss/damage during transit due to defective/inadequate packing.				<u>Vendor to comply</u>

PRICE BID FORMAT

Name of Work :

NIT No. & Date :

Bidder's Offer No. & Date :

Sl. No.	Description of item	Unit	Qty	Basic Rate (in ₹)	Excise Duty (in %)	VAT/CST (in%) (VAT with FORM-17 or CST with C-FORM)	Service Tax (in %)	Total Value (in ₹)
1	Material	Set	01	₹	%	%		₹
2	Spares	Set	01	₹	%	%		₹
3	Installation & Commissioning	Set	01	₹			%	₹
	TOTAL COST (in Figures)							₹
	TOTAL COST (in Words) :							