Annexure-A

Scope for Retrofitting of HMT Machining Center (Model No. HTC-600) Plan No. 2-435, TBM, Bl-3, BHEL Hardwar

Brief About Machine: **The machine comprises of X, Y, Z & B axes with a Spindle and Two pallet type swiveling Pallet changer. Pallet changer is Hydraulic based. All axes, rotary table and spindle are CNC controlled. Existing CNC System is Sinumerik system 8M and has to be replaced. Existing measuring system is 11 microamperes of Heidenhain make and have to be replaced. Existing drives are Gettys drive with GOULD DC servomotors which have to be replaced alongwith the drives. Existing spindle drive is Gettys drive with GOULD AC servomotors which has to be replaced alongwith the drives.**

Sl. No	Description	Quantity	Accepted (Yes/No)	Deviation	Remarks
1.	**MATERIAL SUPPLY INCLUDING SCOPE OF WORK**				
1.1	**CNC SYSTEM : SIEMENS 828D or advanced/ FANUC 0iD or advanced comprising of the following features:**	01 No.			Bidder to provide details &comply
(a)	Milling configuration				Bidder to comply
(b)	Oriented Spindle stop				Bidder to comply
(c)	USB ports, RS232 or Ethernet port for data transfer. (Note: USB port is must for data transfer.)				Bidder to comply
(d)	Measuring systems, lead screw, Backlash & Friction compensation, Bi-directional pitch error compensation facility				Bidder to comply
(e)	Graphic simulation- Single sided 2D view, dynamic				Bidder to comply
(f)	PLC in Ladder diagram / STL format should be provided. Ladder program should be viewable on the monitor of CNC. Status of various signal should be indicated in ladder diagram				Bidder to comply
(g)	CNC user memory for program and data should be 2MB or more.				Bidder to comply
(h)	Features through USER/ Pre-defined keys: 1. Single block. 2. Block search with calculation & without calculations in automatic mode. 3. Optional Stop. 4. Programmable keys. 5. Rapid Feed On/OFF. 6. Co-ordinate system transformation. 7. Co-ordinate system rotation.				Bidder to comply

	8. Helical/ Spline interpolation. 9. Scaling. 10. Mirroring. 11. Facility to store up to 999 subroutines & 9999 part programmes. 12. Facility to store at least 4 zero offsets & at least 2 additive zero-offsets. 13. Oriented Spindle stop. 14. Dry run switch (Dry run freely executable during program run in automatic). 15. Coolant ON / OFF switch/key (Coolant should be switch on/off during Auto/Jog mode irrespective of the definition in the part program). 16. On screen graphic simulation. 17. Programming with polar coordinates.				
1.1.1	Machine Operator panel for Mode selection, Feed override, Spindle override, Cycle START/STOP, Spindle START/STOP, Axes Jogging option, Reset, Incremental Keys (1, 10, 100, 1000 &10000 micron) and User definable keys (minimum 6 nos.).	01 No.			Bidder to comply
1.1.2	Electronic Hand wheel & Handwheel interface (if required) on operator panel	02 Nos.			Bidder to comply
1.1.3	CF card for data transfer.	03 Nos.			Bidder to comply
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.	03 Nos.			Bidder to comply
1.1.5	All Profibus/ interface connectors within all the CNC cabinets as required for successful commissioning shall be in the scope of supply.	01 Set			Bidder to comply
1.1.6	PLC Input/ Output board for 72 inputs & 48 outputs or more.	03 Nos.			Bidder to comply
1.1.7	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.	01 Set			Bidder to comply
1.1.8	Existing RELAYs, TIMERs& PLC have to be removed and complete logic of the machine has to rebuild in new PLC program & electrical scheme.				Bidder to comply
1.1.9	All Softwares along with communication cables for data back-up & restoration.	01 Set			Bidder to comply
1.1.10	The CNC programs for the existing control are generated from offline PC based software. The software is pre-fed with basic profile co-ordinates for T2, T4 & TX blades and technological process. Depending on the size of the job, the program including profile co-ordinates are generated by scaling and rotation. This software has to be either customized or equivalent software is to be provided by the vendor for the offered (new) CNC control. Source code of the existing software (for T2 blade) & Part-programs (1 nos.) are attached for ready reference **(Refer Annexure- A/PROG)**. Software should be compatible to Windows 7 PC. Source code of T4 & TX blades are similar & can also be provided on request. The inputs for the existing technological process will be provided by BHEL	01 Set			Bidder to provide details and comply

	which is to be retained. Three sample programs of T2, T4 & TX (both internal as well as external fillet) variety will be checked by BHEL for verification of the software.				
1.2	**AC SERVO MOTORS FOR CNC CONTROLLED AXES & SPINDLE MOTOR**				
1.2.1	SIEMENS/FANUC AC servo motor of suitable rating for X axis with rated Torque (Mn) of 38 Nm or above and RPM more than or equal to 1400 RPM. Size constraints for the motor has to be accounted for considering the available space in the machine **Existing motor details are as under:** GOULD make, permanent magnet servo motor, Category: M238-J60B-900N, Back emf: 120V/Krpm, Tach: 9.5V/Krpm, Torque constant: 10.14 Lb-inch/ A, Rated current: 33A, Conn. Dia.: 201-133-1026, Outline drwg.: 201-233-3258, Serial no.: 5868 1787.	01 No.			Bidder to provide details and comply
1.2.2	SIEMENS/FANUC AC servo motor with holding brake of suitable rating for Y axis with rated Torque (Mn) of 38 Nm or above and RPM more than or equal to 1400 RPM. Size constraints for the motor has to be accounted for considering the available space in the machine Pls. note Y axis is fitted with hydraulic counterbalance. **Existing motor details are as under:** GOULD make, permanent magnet servo motor, Category: M238-J6CB-900N, Back emf: 120V/Krpm, Tach: 9.5V/Krpm, Torque constant: 10.14 Lb-inch/ A, Rated current: 33A, Conn. Dia.: 201-133-2045, Outline drwg.: 201-233-3197, Serial no.: 1461-0387.	01 No.			Bidder to provide details and comply
1.2.3	SIEMENS/FANUC AC servo motor for Z axis with rated Torque (Mn) of 45 Nm or above and RPM more than or equal to 1800 RPM. Size constraints for the motor has to be accounted for considering the available space in the machine **Existing motor details are as under:** GOULD make, permanent magnet servo motor, Category: M139-J60A-900F, Back emf: 79V/Krpm, Torque constant: 10.14 Lb-inch/ A, Rated current: 60A, Conn. Dia.: 497-301-001.	01 No.			Bidder to provide details and comply
1.2.4	SIEMENS/FANUC AC servo motor for B axis with rated Torque (Mn) of 25 Nm or above and RPM more than or equal to 2000 RPM. Size constraints for the motor has to be accounted for considering the available space in the machine **Existing motor details are as under:** GOULD make, permanent magnet servo motor, Category: M 235-YY0A-90YY-A9, Back emf: 79.5V/Krpm, Tach: 9.5V/Krpm, Torque constant KI: 6.72 Lb-inch/ A, Rated current: 33A, Conn. Dia.: 201-133-1026, Outline drawing: 201-233-2326	01 No.			Bidder to provide details and comply
1.2.5	Suitable SIEMENS/FANUC AC Spindle Motor (Forced Air cooled) with 15 KW or more rated Power & 1500/ 6000 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. **Existing motor details are as under:**	01 No.			Bidder to provide details and comply

	GOULD make, AC Servo Spindle Motor, Category: M575-13, 3Φ, 4 Poles, , Rated current: 86A, 135V, 50 Hz, 15KW/20HP, 1500 rpm, Rated current: 57A/180V/15KW/20HP/6000 rpm				
1.2.6	Supply of intermediate flanges, couplings and any other parts required for mounting of the Axes AC Servo motors (4 Nos.) and Spindle motor (1 No.).	01 Set			Bidder to comply
1.3	**AC SERVO DRIVES & SPINDLE DRIVE**				
1.3.1	SIEMENS/FANUC make AC Servo drive for Feed motors' control with input voltage of 415VAC (+/- 10%), 3 phase 3 wire system.	01 Set			Bidder to provide details and comply
1.3.2	SIEMENS/FANUC make AC drive for Spindle motor control with input voltage of 415VAC (+/- 10%), 3 phase 3 wire system.	01 Set			Bidder to provide details and comply
1.3.3	AC Line Filter with appropriate rating. Maximum ratings of motors offered to be taken into account for calculating the ratings of the Modules.	01 Set			Bidder to provide details and comply
1.3.4	Encoder cables of suitable length for all AC Servo motors & Spindle motor.	01 Set			Bidder to provide details and comply
1.3.5	Power cables of suitable length for all AC Servo motors & Spindle motor. **Please note that X, Z & B axis motor is without holding brake & Y axis motor is having holding brake.**	01 Set			Bidder to provide details and comply
1.3.6	Input supply of 415VAC is available on the machine. If the installed system & Drives require any other rated supply then suitable rated supply transformer to be supplied by the vendor.	01 No.			Bidder to provide details and comply
1.3.7	Shield terminal plates and earthing schematic for all the modules.	01 Set			Bidder to provide details and comply
1.3.8	Pre-assembled cables to connect a laptop with the drives & system for commissioning and diagnosis purposes.	01 Set			Bidder to provide details and comply
1.3.9	Drives commissioning software on CD (Licensed copy) along with interface cables.	01 Set			Bidder to provide details and comply
1.4	**MEASURING SYSTEM**				
1.4.1	The existing X-axis scale & transducer has to be replaced with a suitable scale & transducer (1 Vss output) of Heidenhain make with +/- 5 micron accuracy grade and Measuring length more than existing one. The existing scale is Heidenhain make Type LS 703 & the Measuring length is 920 mm. The Laser Calibration & Accuracy checking of the scale (if required) shall be in the scope of work.	01 No.			Bidder to provide details and comply
1.4.2	The existing Y-axis scale & transducer has to be replaced with a suitable scale & transducers (1 Vss output) of Heidenhain make with +/- 5 micron accuracy grade and Measuring length more than	01 No.			Bidder to provide details and comply

	existing one. The existing scale is Heidenhain make Type LS 703 & the Measuring length is 770 mm. The Laser Calibration & Accuracy checking of the scale (if required) shall be in the scope of work.				
1.4.3	The existing Z-axis scale & transducer has to be replaced with a suitable scale & transducers (1 Vss output) of Heidenhain make with +/- 5 micron accuracy grade and Measuring length more than existing one. The existing scale is Heidenhain make Type LS 703 & the Measuring length is 920 mm. The Laser Calibration & Accuracy checking of the scale (if required) shall be in the scope of work.	01 No.			Bidder to provide details and comply
1.4.4	The existing B-axis encoder/resolver has to be replaced with a suitable ENCODER (1 Vss output) of 18000 PPR or above (apart from motor encoder) of Heidenhain make. The Accuracy checking of the encoder shall be in the scope of work. **The existing encoder details are as below:** RON 705.0000-18000, 5V+/- 5%, Id Nr:292 380-0/Id Nr: 355 879-01, 11µAss, Sr. No: 10 788 829 A8/ SN: 37 899 82 F	01 No.			Bidder to provide details and comply
1.4.5	Position feedback cables from all motor encoders to CNC system as well as from all second encoders/scales & transducers to CNC system.	01 Set			Bidder to provide details and comply
1.4.6	Couplings, Mounting brackets, mounting plates etc. for mounting of scales, transducers, external encoders of all axes/ spindle and other items required for ensuring accuracy and repeatability of the feed axes movement & spindle RPM should be included in the offer. In case any modification in the covers is required, the same shall be included in the offer.	01 Set			Bidder to provide details and comply
1.5	**ELECTRICAL FEATURES**				
1.5.1	It is proposed that the existing electrical cabinet -1 No. (Size: Height: 220 cm, Width: 180 cm, Depth: 62 cm) is to be replaced with reputed make cabinets. The cabinet should be dust and vermin proof. The size should be similar as the existing cabinet with suitable side mounted air-conditioner of reputed make. Size constraints for the electrical cabinet have to be accounted for considering the available space in the machine. The electrical cabinet should not have rear opening. No elements should be mounted on the back-side of the panel. Electrical Cabinet to be equipped with: a) Door limit switch operated panel tube lights with ON/ OFF switch b) Combination of 5A/15A, 3-pin service socket and switch	01 No.			Bidder to comply
1.5.2	Existing CNC system cabinet (Size: Height: 220 cm, Width: 62 cm, Depth: 72 cm) is to be replaced with reputed make operator panel/ cabinet. The operator panel/ cabinet should be dust and vermin proof. Operator Panel/ CNC system cabinet should be aesthetic & with the following features: a) Free standing floor mounted of suitable height	01 No.			Bidder to comply

	b) CNC System is to be mounted in the supplied operator panel. c) Height of the operator panel & display to be suitable for person of average height (5'5") d) Fitted with side mounted suitable air conditioner e) Swivel of minimum 180 degrees f) Front side should have handles for rotating by hand g) The rear door should be on hinges and not screw mounted h) Illumination light with switch for working in the operator panel i) 220 VAC/ 5 Amp 3-pin service socket and switch				
1.5.3	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 left/right side of electrical cabinet.	01 No.			Bidder to comply
1.5.4	Suitable Semiconductor, HRC fuses, fuse bases of GE/ SIEMENS/ BUSSMAN make for overload protection.	01 Set			Bidder to comply
1.5.5	The complete LV switchgear of the machine including overloads, relays, contactors, MCBs, MPCBs etc. is to be supplied & interfaced by the Bidder as per existing scheme. Bidder must interface each induction motor with MPCB for single phase and overload protection.	01 Set			Bidder to comply
1.5.6	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 Bidder	01 Set			Bidder to comply
1.5.7	DC Regulated Power Supply 24V DC, 20 Amps or more of Siemens/Phoenix/Allen Bradley for CNC system & Input/ Outputs.	02 Nos.			Bidder to comply
1.5.8	DC Regulated Power Supply 24V DC, 10 Amps or more of Siemens/Phoenix/Allen Bradley for machine elements.	02 Nos.			Bidder to comply
1.5.9	Sealed machine light of reputed make having halogen lamp (Minimum 70 W).	03 Nos.			Bidder to comply
1.5.10	Wires & Conduits preferably of LAPP/IGUS or reputed make for rewiring of the entire machine including Control, Signal & Power cables, switchgears cables and field elements cables etc. ***Note:*** **The vendor to note that the entire machine has to be rewired. 3-phase 415VAC Input Power Supply to the machine will be provided by BHEL.**	01 Set			Bidder to comply
1.5.11	Bidder should provide the proposed electrical schematic along with bill of material to BHEL for approval of Bill of material prior to dispatch.				Bidder to comply
1.5.12	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			Bidder to comply
1.5.13	All existing Proximity switches, Limit switches, Pressure switches, Flow switches, Float switches shall be replaced with 24 VDC based elements of reputed makes. All Pressure switches & Flow switches should be with digital display for parameters and actual value display.	01 Set			Bidder to comply
1.5.14	All existing solenoid valves are having 110V AC supply. All the above shall be replaced with 24	01 Set			Bidder to comply

	VDC coil based elements of Rexroth/ Parker/ Yuken/Vickers/ Hydac make. The hydraulic logic is to be retained. Any base plates, hydraulic pipes etc. for incorporating the new solenoid valve schemes to be included in the scope of supply.				
1.5.15	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.	02 Nos.			Bidder to comply
1.5.16	All existing operational features of the machine should be retained in the new electrical schematic of the machine.				Bidder to comply
1.5.17	Oil, chip & dust-proof Metallic/ PVC Cable drag chains and end covers/ brackets of reputed make for replacement of all drag chains used on the machine. **Note: One additional drag chain (for Y axis) to be supplied complete with end-covers and brackets.**	01 Set			Bidder to comply
1.6	**OTHER FEATURES:**				
1.6.1	Design and supply of intermediate flanges, couplings and any other parts required for mounting of AC Servo motors (4 Nos.)& Spindle motor (1 Nos.).	01 Set			Bidder to comply
1.6.2	Set of keys for Electrical cabinet & Operator Panel locks.	03 Sets			Bidder to comply
1.6.3	Lapp make hose pipes, DIN rails, cable ducts, insulated lugs, printed ferrules and other material required for the wiring of machine, Electrical & Operator panels as per requirement.	01 Set			Bidder to comply
1.6.4	Party shall supply all clamps, fixtures and fasteners required to complete the retrofitting work.	01 Set			Bidder to comply
1.6.5	Any other material not mentioned above but found necessary to complete the retrofitting work, shall be in party's scope of supply.	01 Set			Bidder to comply
1.7	**MINOR MECHANICAL WORK:**				
1.7.1	**Hydraulic power pack** A new hydraulic power pack has to be provided with following components mounted on its tank- a) Tank with capacity 250litres. b) Main hydraulic pump-Pressure Compensated variable discharge pump of Vickers make model- PVB20-R-20-CMC-11or equivalent. c) Vane pump of Vickers make model-V210-5-1C-12-S214 or equivalent for lubrication. d) Oil level indicator (sight glass). e) Suitable relief valve. f) Pressure gauge. g) Air breather. h) 10micron filter at the outlet of pumps with clog indicator.	01 Set			Bidder to provide details and comply

	i) Air bleed valve. j) Suction strainer. k) The main hydraulic pump delivery should have connection for two outlet of ½" BSP and 1/4" BSP connectors and Lubrication Pump delivery should have one out let connection of ½" BSP connector for connecting hoses to the machine The existing hydraulic power pack is the single source of fluid power to head counter balance spindle key lock, gear shift, power draw bolt pallet index base, pallet clamp/changing system lubrication system of spindle gears and its bearing .The existing lubrication pump is a vane pump as stated above set at 28lpm at 7Kg/cm2 and the existing main hydraulic pump is Pressure Compensated variable discharge pump as stated above set at 55 LPM at 50kg/cm2 All flexible hoses and any other modification required to connect the new power pack with the machine has to be supplied/done by the vendor. The tank has to be connected to the Existing oil chiller unit. All the supplied hydraulic component should be of Rexroth /Vickers/Parker/Yuken make. A suggestive hydraulic circuit diagram SKP-117-2188/6 is attached for reference.				
1.7.2	**Hydraulic system:** All existing solenoid valves are having 110V AC supply. All the above shall be replaced with 24 VDC coil based elements of Rexroth/ Parker/ Yuken/Vickers/ Hydac make. The hydraulic logic is to be retained. Any base plates, hydraulic pipes etc. for incorporating the new solenoid valve schemes to be included in the scope of supply.				Bidder to provide details and comply
1.7.3	**Lubrication oil return system** The existing scavenging pump for returning lubrication oil from machine to tank which is Crown make pump model- OPE-3/L-1/2" is to be replaced with the same new one or equivalent of reputed make like Rexroth/Vickers/Parker/Yuken/Hydac make.	01 Set			Bidder to provide details and comply
1.7.4	**Counter balance system** A new counter balance system of the head (Y-Axis) has to be provided with following components a) One counterbalance valve set at 45 kg/cm2 b) Two piston cylinders with rod diameter 18mm cylinder diameter 40 stroke length 775mm with cushion at head end. c) One accumulator of suitable capacity pre-charged to 35 bar d) pressure switch of range-125 PSI to 1600 PSI e) one direction control solenoid valve All items have to be provided as per existing circuit diagram SKP-117-2188/7, which is attached. All the hydraulic component related to counterbalance system has to be replaced and should be of	01 Set			Bidder to provide details and comply

	Rexroth /Vickers/Parker/Yuken/Hydac make				
1.7.5	**Machine axis lubrication** The 36 tycho –ways and the ball screw of X, Y& Z axis are lubricated through Interlube automatic cycle lubricator of Make-Interlube model- Lubeplus 'E'-LF 2505. This cyclic lubricator is to be replaced with the same or equivalent one of reputed make. Proper functioning of the lubrication system has to be checked and restored. All the piston distributors/metering units installed on the machine is to be replaced with new ones .The existing metring units installed on the machine is of Interlube make –IGZ23(part no.-70304).	01 Set			Bidder to provide details and comply
1.7.6	**Continuous rotary table** a) The existing continuous rotary table is to be completely overhauled, to restore it as per original condition/test chart b) All the Seals, O-rings have to be replaced with new ones. c) All the Bearings in the table assembly as per machine manual available and mentioned below has to be replaced with the equivalent one of TIMKEN /FAG /SKF/FAFNIR/NTN make only. 1) Fafnir make bearing type no: MM9310-W1-2 QUAD E8809 (Matched set) Set of four bearings 2) Angular contact ball bearing 7206 CG –set of two bearing 3) One main thrust bearing(Internal dia. - 395mm approx.) to support table base However the exact designation/dimension of the bearing /seal/table parts should be ascertained by the party during dismantling of table, when the machine will be provided to the party as per clause 4 ii). Apart from the above mentioned work if any other work/modification is required, it will be in party's scope to restore the rotary table.	01 Set			Bidder to provide details and comply
1.7.7	**Over-arm** There is a over-arm bolted to the spindle head to support arbor. The over-arm has to be replaced with the new one of similar design.	01 Set			Bidder to provide details and comply
1.7.8	**Bellow Cover** A new Bellow cover below spindle in Y axis is to be mounted. The HMT part no. of existing bellow cover is SKP-117-2245/5.	01 Set			Bidder to provide details and comply
2	**COMMISSIONING:**				
2.1	Party shall undertake commissioning of the supplied components at BHEL, Haridwar. 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 for successful running of the machine.				Bidder to comply

2.2	New PLC program should incorporate all the drive signals, all possible alarms, suitable interlocking and their display on CNC screen with remedial actions related to the alarms and messages.				Bidder to comply
2.3	Existing machine logic and technological processes have to be retained.				Bidder to comply
3	**FINAL ACCEPTANCE:**				
3.1	Final Acceptance shall be at HEEP, BHEL, Haridwar after: a) Upon completion of the scope of supply and scope of work at BHEL. b) Final acceptance shall include clearance of all pending issues related to the work contract. c) Successful Commissioning & Demonstration of various cycles and control functions as envisaged in the technical scope. Party shall demonstrate operation of all parts of the system supplied along with all the features as specified above. d) Successful machining of presently being machined components as mentioned below: i. External fillet operation on root and shroud side (5 nos. each for T4 & TX design blades). ii. The blank raw material, tooling & fixture for machining of the blades will be provided by BHEL. e) After settlement of all pending issues related to work and supply, a certificate for Completion of works in all respect shall be released within 15 days by Production and Maintenance personnel of BHEL which will be the referred document for Final Acceptance and final payment to the Bidder**.**				Bidder to comply
4	**DELIVERY :(IF DELIVERY PERIOD IS NOT OFFERED/ ACCEPTABLE, OFFER WILL BE REJECTED)**				
	i) Material: 6 months from the date of completion of activity at Sr. no. ii) below. ii) The party shall be provided the machine within one month for 3 weeks after placement of Work order to ascertain exact details of material required for mechanical/hydraulic work. Vendor shall have to carry out this activity within 15 days of placement of the work order. Vendor shall have to re-assemble the machine and hand-over the machine for production after getting the necessary details. iii) Work: 12 weeks from date of release of machine for work. The delivery period of work for the purpose of LD as per Clause 11 shall be considered from the date of start of work to the date of start of the machine after carrying out the work and start of the work on the first prove-out component. iv) Vendor to note that early delivery shall be acceptable. Vendor should take BHEL approval before invoking this clause.				Bidder to provide details and comply
5	**DOCUMENTATION**				
	Following documents shall be supplied by the Party:				

5.1	CNC system manuals in hard copy comprising of Installation & Start-up guide, Connecting conditions, Configuration guide, Diagnostics guide, Commissioning guide.	03 Sets			Bidder to comply
5.2	Technical and Service manuals of the AC servomotors & Spindle motor in hard copy.	03 Sets			Bidder to comply
5.3	Commissioning and service manuals of the AC servo drives & Spindle drive.	03 Sets			Bidder to comply
5.4	Commissioning and service manuals of the PLC.	03 Sets			Bidder to comply
5.5	PLC program hard copy with comments in English & cross-reference list.	03 Sets			Bidder to comply
5.6	PLC program on USB disk (64 GB) in installable & printable formats.	01 Set			Bidder to comply
5.7	New electrical schematic of the machine in hard copy as well as in soft copy.	03 Sets			Bidder to comply
5.8	Instructions for data back-up & restoration for CNC, PLC, Feed drives & Spindle drive.	03 Sets			Bidder to comply
5.9	All documentation, ghost backup / Image of CNC system, CNC, Spindle & Feed Drive parameters & back-up on Portable hard disk (min. 1 TB).	01 Set			Bidder to comply
5.10	Documentation of all bought-out items hard copy as well as in soft copy.	03 Sets			Bidder to comply
5.11	Drawings of all mechanical modifications, Table, mountings, flanges & couplings.	03 Sets			Bidder to comply
5.12	Programming Manuals.	03 Sets			Bidder to comply
5.13	Additional required Softwares for machine maintenance on CD/DVD in installable format.	01 No.			Bidder to comply
5.14	Complete list of bill of materials including make/manufacturer.	03 Sets			Bidder to comply
6	**SPARES: (TO BE COMPULSORILY QUOTED OTHERWISE OFFER WILL BE REJECTED) :**				
	Party shall compulsorily quote following spare parts:				
6.1	Active Line Module /IR module with Line filter and HF commutating choke of appropriate rating of the highest rating used on the machine.	01 Set			Bidder to comply
6.2	Drive modules for X, Y, Z & B axis, Spindle drive (Each type as used on machine).	01 No. of each type			Bidder to comply
6.3	Indicating lamps used on the machine of each type.	10 Nos. of each type			Bidder to comply
6.4	Relays, Contactors, Push buttons, Selector switches of each type.	10 Nos. of each type			Bidder to comply
6.5	Complete CNC control (as used on the machine).	01 No.			Bidder to comply
6.6	Scale with Transducer (including signals Converters if applicable) (Each type as used on the machine).	01 No.			Bidder to comply
6.7	All the seals of continuous rotary table.	05 no. each type			Bidder to comply

7	**WARRANTY:**				
	Party shall stand warranty for all the supplied material and work executed for a period of one year from the date of final acceptance (Ref.: Clause No. 3) of the machine at BHEL, Haridwar.				Bidder to comply
8	**TRAINING:**				
8.1	Party shall impart training to BHEL staff, for operation & maintenance of the system supplied by them during installation & commissioning. Party to provide practical training on how to replace & synchronize the motor encoder using the drive software.				Bidder to comply
8.2	Vendor to arrange one week training each for: a) 1 person for Maintenance & commissioning of CNC system at CNC System manufacturer's works. b) 1 person for Programming & 2 persons for Operations of CNC system at CNC System manufacturer's works. Expenses for Boarding & Lodging of BHEL personnel during training shall be borne by BHEL.				Bidder to comply
9	**VENDOR'S OBLIGATION:**				
	The Vendor shall bring all tools, tackles and testing equipment with them for successful commissioning of supplied system.				Bidder to comply
10	**QUALIFYING CONDITIONS**				
10.1	Average Annual financial turnover during the last 3 years, ending 31st March 2014, should be at least ₹20.79 Lacs. Vendor should submit Audited balance sheets for the last three years.				Bidder to provide details & comply
10.2	The Vendor must have successfully retrofitted machines with Siemens 828-D/ Fanuc 0i CNC system during last seven years ending 30th June 2015 and should be either of the following: a) Three projects of machines retrofitted with Siemens 828-D/ Fanuc 0i CNC system with each project costing not less than ₹27.72 Lacs. or b) Two projects of machines retrofitted with Siemens 828-D/ Fanuc 0i CNC system with each project costing not less than ₹34.66 Lacs. or c) One project of machines retrofitted with Siemens 828-D/ Fanuc 0i CNC system with the project costing not less than ₹55.45 Lacs. The above retrofitted machines should be running satisfactorily for at least 6 months prior to **30th June, 2015.** 6 months period will be calculated on the basis of commissioning certificates provided.				Bidder to provide details & comply

	Vendor to provide P.O. / W.O copies and commissioning/ performance certificates for satisfactory operation of the above retrofitted systems along with name, address & contact details including e-mail IDs, telephone numbers of their customer. BHEL reserves the right to verify the information provided. Vendor is advised to attach only the relevant certificates and not attach papers irrelevant against this clause.				
11	**LATE DELIVERY PENALTY (LD) CLAUSE:-**				Bidder to comply
11.1	LD @ ½% per week subject to a maximum of 10% of the Material cost including spare parts shall be applicable for delay in deliveries. 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 LD. Vendor should intimate regarding PDI 7 days in advance only.				Bidder to comply
11.2	LD @ 2% per week subject to a maximum of 10% of the Commissioning Charges shall be applicable for delay beyond scheduled commissioning date as per Clause 4 iii) for reasons attributed to the party.				Bidder to comply
12	**PRE-DISPATCH INSPECTION**				Bidder to comply
12.1	Pre-dispatch inspection of all the items covered under Scope of Supply at Para (1) & spares at Para (6) shall be carried out by BHEL personnel at party's works.				Bidder to comply
12.2	Supplier shall invite BHEL for carrying out pre- inspection.				Bidder to comply
12.3	Deputed BHEL persons shall do pre acceptance of material under scope of supply at vendor works and give dispatch clearance.				Bidder to comply
12.4	Expenses of Boarding and lodging of BHEL personnel during PDI shall be borne by BHEL.				Bidder to comply
13	**SUBMISSION OF BILL OF MATERIAL (BOM)**				Bidder to comply
13.1	Before inviting BHEL for Pre-dispatch inspection, vendor shall submit to BHEL the Bill of Material (BOM) and proposed electrical drawing/ schematic for approval of Bill of Material (BOM).				Bidder to comply
14	**EARNEST MONEY DEPOSIT (EMD):**				Bidder to comply
14.1	Vendors have to deposit the ₹ 1,50,000/-as EMD. EMD may be deposited in cash, through pay order or through demand draft in favor of HEEP, BHEL, Haridwar only.				Bidder to comply
14.2	EMD shall be converted to security deposit if the work is awarded.				Bidder to comply
14.3	EMD of unsuccessful bidders shall be refunded back normally within fifteen days of acceptance of				Bidder to comply

	award of work by the successful bidder.				
14.4	EMD shall not carry any interest.				Bidder to comply
14.5	EMD by tenderer will be forfeited as per tender documents, if:				Bidder to comply
14.5.1	After opening the tender, the tenderer revokes his tender within the validity period or increases his earlier quoted rates.				Bidder to comply
14.5.2	The tenderer does not commence the work within the period as per LOI/contract.				Bidder to comply
14.6	**Offers without EMD will be rejected and will not be considered for evaluation. However** "MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or EM II certificate along with attested copy of a CA certificate (Format enclosed at Annexure -1 where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid). Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaoed on the portal. Documents should be notarized or attested by a Gazetted officer. "				Bidder to comply
15	**SECURITY DEPOSIT (SD):-**				Bidder to comply
15.1	Successful vendor shall deposit security. The rate of security deposit will be as below:				Bidder to comply
	• For work Up to ₹10 Lakhs : 10% of work order value				Bidder to comply
	• Above ₹ 10 Lakhs upto ₹ 50 Lakhs : ₹ 1 Lakh + 7.5% amount exceeding ₹10 Lakhs				Bidder to comply
	• Above ₹ 50 Lakhs: ₹ 4 Lakhs + 5% amount exceeding ₹ 50 Lakhs				Bidder to comply
15.2	The security deposit should be submitted before the start of work in the following forms:				Bidder to comply
	i) Cash (As permissible under the Income Tax Act)				Bidder to comply
	ii) Pay Order, Demand Draft in favour of HEEP, BHEL, Haridwar.				Bidder to comply
	iii) Local cheques of Scheduled Banks, subject to realization.				Bidder to comply
	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.				Bidder to comply
15.3	Security Deposit shall not carry any interest.				Bidder to comply
15.4	EMD of successful tenderer can be converted and adjusted against the Security Deposit.				Bidder to comply
15.5	**100% of the Security Deposit** amount shall be refunded to the vendor after final acceptance of work. **SD shall be released after the submission of Performance Bank Guarantee (PBG) by the vendor.**				Bidder to comply

16	**PERFORMANCE BANK GUARANTEE (PBG):**				Bidder to comply
16.1	Vendor shall be required to submit a Performance Bank Guarantee (PBG) for 10% of the total work order/ contract value which shall be valid for a period of 12 months from the date of final acceptance of the machine.				Bidder to comply
16.2	The PBG shall be submitted on a non-judicial stamp paper of value not less than₹100/- issued by any one of the nationalized banks.				Bidder to comply
17	**PAYMENT TERMS:** **(Note: No advance payment shall be made to the vendor.)**				Bidder to comply
17.1	Part payment will be made after completion of following milestones:				Bidder to comply
17.1.1	Payment of 80% of material cost along with 100% of all taxes & duties (Excise duty, CST/VAT as applicable) shall be payable after inspection & acceptance of material at HEEP, BHEL, Haridwar. Vendor to ensure that all relevant documents are submitted.				Bidder to comply
17.1.2	Final payment of balance 20% of material cost, 100% of commissioning charges including service taxes as applicable amount will be made after Final acceptance of the machine (As per Clause 3). The payment shall be made subject to submission of PBG as per "Para 16".				Bidder to comply
17.2	All the payments shall be made through e-payment after submission of following documents along with first bill.				Bidder to comply
17.2.1	E-payment form duly filled (Form will be provided by BHEL)				Bidder to comply
17.2.2	Income tax exemption letter(if applicable)				Bidder to comply
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.				Bidder to comply
17.4	Timely submission of CENVATABLE invoices along with necessary documents to enable availment of CENVAT (Excise duty, Service Tax & VAT) credit by BHEL. ***Note: Wherever CENVAT credit cannot be availed within given time limit due to delay in submission of invoices or for any other reasons attributed to vendor, loss of such CENVAT credit will be recovered from such vendor.***				Bidder to comply
18	**Risk Purchase Clause:** In case of delays in supplies / defective supplies or non-fulfillment 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				Bidder to comply

	PURCHASE, they may be banned for business with BHEL.				
19	**GENERAL CONDITIONS:**				
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 & quoting inadequate quantity can lead to dis-qualification of the offer.				Bidder to comply
19.2	The Vendor is advised to inspect the machine & collect 'Program generation Source code' (compatible with existing CNC system) to ascertain all the relevant details required for successful completion of the work.				Bidder to comply
19.3	The proposed electrical schematic & Bill of Material for the machine shall be provided by the vendor prior to pre dispatch inspection.				Bidder to comply
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 wherever necessary.				Bidder to comply
19.5	Vendor must compulsorily quote the quantity exactly as per the Scope of supply. No reduction in quantity as per the above Scope of supply is permissible.				Bidder to comply
19.6	Vendor must quote the Spare parts separately in the offer otherwise the offer will be rejected.				Bidder to comply
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				Bidder to comply
19.8	**The award of works will be made on basis of the total of Material cost, Spare Parts cost, Commissioning charges and all taxes, duties as applicable (Cost to BHEL).**				Information to Bidder
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.				Information to Bidder
19.10	Check List as per Annexure 'C' must be enclosed with techno-commercial bid.				Bidder to comply
19.11	The risk of delay/loss in transmission by post/courier rest with the bidder.				Bidder to comply
19.12	Conditional tender is likely to be rejected.				Bidder to comply
19.13	BHEL reserves the right to reject the lowest or any tender or accept any tender in full or in part without assigning any reasons whatsoever.				Bidder to comply
19.14	If any information/documents submitted by the contractor are found false/fake at any stage, the tender will be cancelled and earnest money deposited shall be forfeited debarring from the future participation in tenders.				Bidder to comply
19.15	In case more than one contractor quotes equal L-1 rates, lottery shall be drawn among L-1 parties to decide one L-1 party.				Bidder to comply

19.16	**Vendor must note that all the retrofitting and minor mechanical work in the scope of this tender, has to be carried out at BHEL works only. In any case, vendor will not be allowed to transport the complete machine or major assemblies outside BHEL works. Therefore, vendor is advised to inspect the machine before bidding to collect & ascertain all the relevant details required for successful completion of work.**				Bidder to comply
20	**BHEL'S OBLIGATION:**				
20.1	Existing electrical schematic of the machine shall be provided by BHEL to the vendor.				Bidder to comply
20.2	Crane facility along with lifting tackles, trolleys etc. will be made available free of charge while working in BHEL premises only.				Bidder to comply
20.3	Facilities of minor welding, brazing, minor machining limited to fitting work /rework etc. will be made available free of cost inside BHEL premises subject to availability.				Bidder to comply
20.4	Any civil work required for the erection of panel shall be done by BHEL.				Bidder to comply
20.5	Consumables like lubricants, kerosene oil, cotton waste etc. will be supplied free of cost by BHEL during execution of works inside BHEL premises. Contractor should make his own arrangements for all types of hand tools including pneumatic/electrical drill machines, grinders, scraping tools along with the general purpose measuring instruments, straight edges etc.				Bidder to comply
21	**OFFER :-** The offer should be submitted in two parts and in following manner.				
21.1	**Techno-commercial Bid :**				
21.1.1	The envelop shall contain the Techno-commercial Bid **(ANNEXURE 'A')** 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, P.O copies & Commissioning/ Performance certificates (against Pre-qualifying conditions) , **Tender fees, EMD** and Check List as per **ANNEXURE 'C'.**				Bidder to comply
21.1.2	The envelop shall be super scribed with "Techno-Commercial Bid", Name of work & NIT No.				Bidder to comply

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 in the format provided by BHEL. Each page of the compliance list has to be signed by the vendor.				Bidder to comply
21.1.4	The vendor must note that no prices are to be quoted/ mentioned in the techno-commercial offer. Vendor must include un-priced Price bid.				Bidder to comply
21.2	**PRICE BID :**				
21.2.1	The second envelope shall contain only the price bid with separate price for material, spares, work & applicable taxes & duties on Price Bid Format only as per **ANNEXURE 'B'.**				Bidder to comply
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.				Bidder to comply
21.2.3	The envelope shall be sealed and super scribed with "Price Bid", Name of work & NIT No.				Bidder to comply
21.2.4	Price bids of techno commercially accepted vendors shall be opened.				Bidder to comply
21.3	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.				Information to Bidder
21.4	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. & due date and shall be submitted in the **Tender Box kept in the Tender room of Purchase department at the 4th floor of the Main Administrative Building of BHEL,HEEP,HARIDWAR** and it should also contain the Bidder's address.				Bidder to comply
21.5	In case the date of tender opening happens to be a BHEL declared holiday, tenders shall be opened on the next working day.				Information to Bidder
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"				Bidder to comply
22.2	Validity of offer shall be for a minimum period of 120 days from the date of Tender Opening.				Bidder to comply
22.3	Freight & transit insurance charges from Dispatching station to BHEL, Haridwar shall be borne by the				Bidder to comply

	party.				
22.4	The material will be dispatched to **Central Plant Stores, HEEP, BHEL, Haridwar** with instructions to forward the same to **Sr. Engineer (WEX/CNC-BLADES), HEEP, BHEL, Haridwar-249403.**				Bidder to comply
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				Bidder to comply

ANNEXURE 'B' (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) :							

Note: Bidder may please note that all relevant columns should be duly filled up and in case any column is left blank it will be considered as inclusive in the prices quoted. All pages to be duly signed and stamped by authorised signatory.

Annexure 'C'
CHECK LIST FOR TENDER

NIT No. : _____

Bidder shall ensure that following documents / particulars have been enclosed with tender. This check list shall be enclosed with Techno-commercial Bid.

S. No.	Particulars	YES/NO	REMARKS
1.	**Sealed Techno-commercial Bid with Un-priced price bid** as per Annexure 'A' of NIT		
2.	**Sealed Price Bid** as per Annexure 'B' of NIT		
3.	**Compliance** to all the points of the Annexure 'A' of NIT		
4.	**Audited balance sheets** for the last three years should be submitted i.e. 2013-14, 2012-13 & 2011-12 required as per Clause 10.1 of Annexure 'A' of NIT		
5.	**P.O. copies and Commissioning/ Performance certificates** required as per Clause 10.2 of Annexure 'A' of NIT		
6.	**Name, address & contact details of their customer** required as per Clause 10.2 of Annexure 'A' of NIT		
7.	**Tender Fee** enclosed		
8.	**Earnest Money Deposit (EMD)** required as per Clause 14 of Annexure 'A' of NIT		
9.	**Complete specifications** such as Part no. / Model / Type of Drive and Servo motors, power, torque, Rated and max. RPMs, Rated and max. currents of servo motors. Ordering brochure/catalogue should be attached required as per Clause 19.4 of Annexure 'A' of NIT		

Sign & Seal

Annexure- A/PROG

SAMPLE PART PROGRAM

```
%2000
(DRG NO. :  2-10202-18007 REV 00)
(BLADE  :  T4-45-57 ST15L)
(PROG LH MOVING SUCTION SIDE)
(CUTTER DIA  140.00)
(MACHINE  : HTC 600)
(LAYOUT NO 2-435,EQUIP. CODE 624,WORK CENTER NO 2621)
(CONTROL  : SINUMERIK 8M)
(MOUNT PROPER ARBOR AND CUTTER)
(LOAD TOOL AND ARBOR)
(CHK PROPER FIXTURE MOUNTING)
(ENTER ZERO OFFSET IN N1 STORE)
N0010G0G90G71G94G80G40G64
N0020L500
/N0030L60
N0040R50199900
N0050R5175899
N0060R52-5837
N0070R53-15645
N0080R5443243
N0090R5529204
N0100R56-44673
N0110L100
N0120G0G90G55B0
N0130G55X170000Y270000Z500000
N0140B-5837
N0150L999
N0160G59X-214
N0170G43D10Z-2096
N0180L01
N0190L999
N0200G59X0
N0210G0G43D10Z0
N0220L01
```

N0230L600
N0240G0G90G57
N0250B164354
N0260L999
N0270G59X-2702
N0280G43D20Z-9653
N0290L02
N0300L999
N0310G59X-2008
N0320G43D20Z-7173
N0330L02
N0340L999
N0350G59X-1314
N0360G43D20Z-4693
N0370L02
N0380L999
N0390G59X-619
N0400G43D20Z-2213
N0410L02
N0420L999
N0430G59X0
N0440G0G43D20Z0
N0450L02
N0460L500
/N0470L60
/N0480M0(CHECKING OF JOB BY QC)
N0490M02
%SP
L0100
(SUB PROG FOR ROOT END)
N0010G42D60G90G00X155000Y250000
N0020X145000Y10000
N0030M3M7S182
N0040Y-70081
N0050G01X-2876F00254
N0060Y1919
N0070GO3X-4166Y6061I-7299
N0080X-7717Y9507I-8235J-4934
N0090X-9628Y10566I-7499J-11280

N0100X-11228Y11173I-5605J-12370
N0110X-12661Y11536I-4149J-13357
N0120X-16355Y11745I-2605J-13281
N0130X-22206Y9926I1073J-13773
N0140X-26082Y6955I7498J-13799
N0150X-29910Y2192I15829J-16642
N0160X-33061Y-3556I29969J-20167
N0170X-35710Y-10034I54000J-25864
N0180X-37945Y-17115I82260J-29859
N0190X-39551Y-23389I121425J-34435
N0200X-40874Y-29501I164782J-38852
N0210G01X-55065Y-101501
N0220G00X-197065M9
N0230Y260000
N0240D0Y265000
M17
L0200
(SUB PROG FOR SHROUND END)
N0010G41D70X-155000Y250000
N0020X-145000Y10000
N0030M3M7S182
N0040Y-70081
N0050G01X2909
N0060Y1999
N0070GO2X4165Y6061I7196
N0080X7743Y9489I8008J-4778
N0090X9680Y10530I7215J-11113
N0100X11307Y11118I5391J-12365
N0110X12766Y11463I3958J-13490
N0120X16540Y11617I2445J-13608
N0130X22550Y9688I-1303J-14388
N0140X26559Y6627I-8017J-14653
N0150X30547Y1754I-16747J-17773
N0160X33857Y-4104I-31329J-21570
N0170X36666Y-10692I-55889J-27721
N0180X39061Y-17882I-84508J-32138
N0190X40800Y-24247I-124081J-37328
N0200X42247Y-30445I-167748J-42421
N0210G01X57661Y-102445

```
N0220G00X199661M9
N0230Y260000
N0240D0Y265000
M17
M02
```

SOURCE CODE FOR T2 BLADES

```
#include<stdio.h>
#include<graphics.h>
#include<dos.h>
#include<iostream.h>
#include<conio.h>
#include<math.h>
#include<string.h>
#include<stdlib.h>
class fapt{
public:
float  v[106];
char *str1;
char *str2;
char *str3;
char *str4;
 char *st;
int sflag,incr,oflag;
struct point {
                                float x;
                                float y;
                        } p[45];
struct circle{
                                struct point p;
                                float r;
                                }  c[17];
struct line{
                        struct point p;
                        float m;
                        float c;
                        } s[3];
void mf1();
```

```
void mf2();
void mf3();
void mf4();
void mf5();
void mf6();
void mf7();
void mf8();
void mf9();
void mf12();
void mf13();
void mf14();
int menu();     //main
void show();
void end();
void process();
void start();
void seqn();
void point1(float x,float y,int index);          //point
void point1(struct point p1,struct point p2,float a,int index);   //point with angle rotation
void point1(struct line l1,struct line l2,int index);
void point1(struct line s,struct circle c,int index);
void line1(struct point p,struct circle c,int index);
void line1(struct circle c,char a ,int index);
void circle1(struct point p1,struct point p2, struct point p3,int index);
void code(float v,int i,char *c) ;
void c_rotation(struct circle c,char *s,struct point p);
void c_rotation(struct circle c,int pindex);
void c_rotation(struct circle c,int pindex1,int pindex2);
long int rnd(float a);
};
FILE *stream;

void fapt::point1(float x,float y,int index)
                        {
                                p[index].x=x;
                                p[index].y=y;
                        }

void fapt::point1(struct point p1,struct point p2,float a,int index)
```

```
 {
                p[index].x=(p1.x-p2.x)*cos(a)+(p2.y-p1.y)*sin(a)+p2.x;
                p[index].y=(p1.x-p2.x)*sin(a)+(p1.y-p2.y)*cos(a)+p2.y;
 }

void fapt::point1(struct line l1,struct line l2,int index)
        {
                 p[index].x=(l2.c-l1.c)/(l1.m-l2.m);
                 p[index].y=(l1.m*p[index].x)+l1.c;
        }


void fapt::line1(struct point p,struct circle c,int index)
        {
                s[index].p.x=p.x;
                s[index].p.y=p.y;
                s[index].m=(c.p.x-p.x)/(p.y-c.p.y);
                s[index].c=p.y-s[index].m*p.x;
        }

void fapt::circle1(struct point p1,struct point p2, struct point p3,int index)
        {

                 float z=2.0;
                 float u=(float)((p2.x-p3.x)*((pow(p1.x,z)-pow(p2.x,z))+(pow(p1.y,z)-pow(p2.y,z))));
                 float v=(float)((p1.x-p2.x)*((pow(p2.x,z)-pow(p3.x,z))+(pow(p2.y,z)-pow(p3.y,z))));
                 float w=(float)(2*((p1.y-p2.y)*(p2.x-p3.x)-(p2.y-p3.y)*(p1.x-p2.x)));
                 c[index].p.y=(float)(u-v)/w;
                 c[index].p.x=(float)((pow(p2.x,z)+pow(p2.y,z)-pow(p3.x,z)-pow(p3.y,z))+2*c[index].p.y*(p3.y-p2.y))/(2*(p2.x-p3.x));
                 float  q=(float)(-1)*(p1.x*p1.x+p1.y*p1.y-2*c[index].p.x*p1.x-2*c[index].p.y*p1.y);
                 c[index].r=(float)sqrt(c[index].p.x*c[index].p.x+c[index].p.y*c[index].p.y-q);
        }

void fapt::code(float v,int i,char *c)
        {
                 int l,b;
                 float a;
                 char s[20];
                 char *d="0";
```

```
switch(i){
case -33:
                    seqn();
                    a=(v*1000);
                    fprintf(stream,"%s%ld",c,(long int)a);
                    break;
case -30:
                    seqn();
                    a=v;
                    fprintf(stream,"%s%ld",c,(long int)a);
                    break;
case 20:
                    seqn();
                    b=(int)v;
                    itoa(b,s,10);
                    l=strlen(s);
                    if(l==1)
                    {
                    fprintf(stream,"%s%s%s",c,d,s);
                    }
                    else
                    fprintf(stream,"%c%ld",c,b);
                    break;
case  30:
          seqn();
          b=(int)(v+0.5);
          itoa(b,s,10);
          l=strlen(s);
          if(l==1)
          {
          d="00";
          //strcat(d,s);
          fprintf(stream,"%s%s%d",c,d,b);
          }
          else if(l==2)
          {
          d="0";
          //strcat(d,s);
          fprintf(stream,"%s%s%d",c,d,b);
```

```
                        }
                        else
                        fprintf(stream,"%s%ld",c,(long int)b);
                        break;
                }
 }

void fapt::c_rotation(struct circle c,char *g,struct point p1)
                {
                        if(strcmp("CCW",g)==0)
                                {
                                 seqn();
                                 fprintf(stream,"GO3X%ldY%ldI%ld",rnd(p1.x),rnd(p1.y),rnd(c.p.x-p[44].x));
                                 }
                        else if(strcmp("CW",g)==0)
                                {
                                        seqn();
                                        fprintf(stream,"GO2X%ldY%ldI%ld",rnd(p1.x),rnd(p1.y),rnd(c.p.x-p[44].x));
                                 }
                }

void fapt::c_rotation(struct circle c,int pindex)
                        {
                                seqn();
                                fprintf(stream,"X%ldY%ld",rnd(p[pindex].x),rnd(p[pindex].y));
                                fprintf(stream,"I%ldJ%ld",rnd(c.p.x-p[pindex-1].x),rnd(c.p.y-p[pindex-1].y));
                        }

void fapt::c_rotation(struct circle c,int pindex1,int pindex2)
                        {
                         seqn();
                         fprintf(stream,"X%ldY%ld",rnd(p[pindex1].x),rnd(p[pindex1].y));
                         fprintf(stream,"I%ldJ%ld",rnd(c.p.x-p[pindex2].x),rnd(c.p.y-p[pindex2].y));
                        }

long int fapt::rnd(float h)
                {
                         h=h*1000;
                         h=floor(h);
```

```
                return (long int)h;
        }

void fapt::seqn()
        {
                char s[20];
                int l;
                if(sflag==1)
                {
                        itoa(incr,s,10) ;
                        l=strlen(s);
                        switch(l)
                                {
                                 case 2:
                                  if(oflag==1)
                                  fprintf(stream,"\n/N00%d",incr);
                                  else
                                  fprintf(stream,"\nN00%d",incr);
                                  break;
                                case 3:
                                 if(oflag==1)
                                  fprintf(stream,"\n/N0%d",incr);
                                else
                                 fprintf(stream,"\nN0%d",incr);
                        }
                 incr=incr+10;
                }
        }


void fapt::mf12(){
                code(v[11],-33,"R50");
                  code(v[13],-33,"R51");
                  code(v[28],-33,"R52");
                  code(v[49],-33,"R53");
                v[76]=(12.64*(v[1]*v[26]))/32;
                  v[98]=(7.37*(v[1]*v[25]))/32;
                  point1(v[76],v[98],20);
                  if(v[24]==1)
```

```
                    v[17]=v[2]-90;
                    else
                    v[17]=90-v[2];
                    point1(p[20],p[41],(v[17]*3.141)/180,40);
                    v[77]=p[40].x;
                    v[99]=p[40].y;
                    v[18]=cos((v[6]*3.141)/180);
                    v[32]=v[8]+v[7]/2;
                    v[35]=fabs(v[77]);
                    v[33]=v[32]+v[35];
                    v[34]=v[9]-(v[99]*v[25]);
                    v[36]=(-1*(v[33]*v[26]))/v[22];
                    v[37]=v[34]*v[25];
                    v[38]=(v[33]*v[26])/v[18];
                   code(v[36],-33,"R54");
                    code(v[37],-33,"R55");
                   code(v[38],-33,"R56");
                    seqn();
                    fprintf(stream,"L100");
          }

void fapt::mf13(){
                   code(v[47],-33,"B");
                    v[41]=cos((3.141*v[40])/180);
                   v[42]=tan((3.141*v[40])/180);
                    v[43]=fabs(v[28]);
                    v[44]=v[28]/v[43];
                    v[45]=v[44]*v[42];
                    v[30]=fabs(v[29]);
                    v[31]=v[30]*v[41];
                    v[39]=v[31]-v[4];
                   if(v[39]<=0)
                   {
                   label1: if(v[48]==2)
                                          { seqn();
                                           fprintf(stream,"G0G43D20Z0");
                                          }
                                         else
                                          {
```

```
                                        seqn();
                                        fprintf(stream,"G0G43D10Z0");
                                }

        code(v[48],20,"L");
}
else
{
        label2:  v[39]=v[31]-v[4];
                 if(v[39]<=0)
                 {
                  seqn();
                  fprintf(stream,"L999");
                  seqn();
                 fprintf(stream,"G59X0");
                 goto label1;
                 }
                 else
                 {
         v[31]=v[31]-v[4];
         v[46]=v[31]*v[45];
         seqn();
         fprintf(stream,"L999");
         seqn();
        fprintf(stream,"G59");
         sflag=0;
         code(v[46],-33,"X");
         sflag=1;
         if(v[48]==2)
         {
                  seqn();
                  fprintf(stream,"G43D20");
                  sflag=0;
                  code(v[31],-33,"Z-");
                  sflag=1;
                  code(v[48],20,"L");
                  goto label2;
        }
         else
```

```
                    {
                        seqn();
                        fprintf(stream,"G43D10");
                       sflag=0;
                        code(v[31],-33,"Z-")   ;
                        sflag=1;
                        code(v[48],20,"L");
                        goto label2;
                    }

                    }
                }
            }
```

```
void fapt::mf8(){
                    int count1=57,count2=79;
                    for(int i=1;i<20;i++)
                    {
                      point1(v[count1],v[count2],i);
                      ++count1;
                      ++count2;
                    }

                    count1=1;
                    for(i=21;i<40;i++)
                    {
                      point1(p[count1],p[41],(v[23]*3.141)/180,i);
                      ++count1;
                    }
                    circle1(p[21],p[23],p[25],1);
                    circle1(p[23],p[25],p[26],2);
                    circle1(p[25],p[26],p[28],3);
                    circle1(p[26],p[28],p[30],4);
```

```
                        circle1(p[28],p[30],p[31],5);
                        circle1(p[31],p[34],p[35],13);
                        circle1(p[34],p[35],p[36],14);
                        circle1(p[35],p[36],p[37],15);
                        circle1(p[36],p[37],p[38],16);
                        circle1(p[37],p[38],p[39],17);
                        line1(p[39],c[17],2);
                        v[105]=p[39].y;
                        v[106]=v[105]+10;
                        s[3].p.x=0;
                        s[3].p.y=v[106];
                        s[3].m=0;
                        s[3].c=v[106];
                        point1(s[2],s[3],45);
        }

void fapt::mf9(){
                        int count1=57,count2=79;
                        for(int i=1;i<17;i++)
                        {
                          point1(v[count1],v[count2],i);
                          ++count1;
                          ++count2;
                        }

                        count1=1;

                        for(i=21;i<37;i++)
                        {
                          point1(p[count1],p[41],(v[23]*3.141)/180,i);
                          ++count1;
                        }

                          circle1(p[21],p[22],p[23],1);
                          circle1(p[22],p[23],p[24],2);
                          circle1(p[23],p[24],p[25],3);
                          circle1(p[24],p[25],p[26],4);
                          circle1(p[25],p[26],p[27],5);
                          circle1(p[26],p[27],p[28],6);
```

```
                circle1(p[27],p[28],p[29],7);
                circle1(p[28],p[29],p[30],8);
                circle1(p[29],p[30],p[31],9);
                circle1(p[30],p[31],p[32],10);
                circle1(p[31],p[32],p[33],11);
                circle1(p[32],p[33],p[34],12);
                circle1(p[33],p[34],p[35],13);
                circle1(p[34],p[35],p[36],14);


               line1(p[36],c[14],2);
               v[105]=p[36].y;
               v[106]=v[105]-v[51];
               s[3].p.x=0;
               s[3].p.y=v[106];
               s[3].m=0;
               s[3].c=v[106];
               point1(s[2],s[3],45);
        }




int main()
{
 fapt f;
 //char ano;
  f.start();
  f.menu();

  f.end();
  exit(0);
 return 0;
}


void fapt::mf1()
```

```
{
int count =57;
float a[16]={0.0,-0.63,-1.72,-1.82,-0.39,0.40,1.20,2.40,4.80,8.00,9.60,14.40,19.20,24.00,27.20,30.40 };
for(int i=0;i<16;i++)
{
v[count]=a[i]/v[56];
count++;
}
count =79;

float b[16]={0.00,0.55,2.42,5.16,8.51,9.42,10.14,10.91,11.88,12.33,12.33,11.65,9.95,7.23,4.86,1.95};
for(i=0;i<16;i++)
{
v[count]= b[i]/v[78];
count++;
}
mf9();
}
void fapt::mf2()
{

int count =57;
float a[19]={-1.72,1.38,-0.63,2.76,0.0,1.60,5.52,2.40,6.9,4.00,8.00,8.97,9.66,11.20,14.40,17.6,22.40,27.20,30.40 };
for(int i=0;i<19;i++)
{
v[count]=a[i]/v[56];
count++;
}

count =79;
float b[19]={2.42,1.69,0.55,0.62,0.0,-0.69,0.01,-0.81,0.27,-0.69,0.22,1.31,1.65,0.99,1.50,1.78,1.73,1.09,0.33};
for(i=0;i<19;i++)
{
v[count]= b[i]/v[78];
count++;
}

mf8();
}
```

```
void fapt::mf3()
{

            fprintf(stream,"\n(CUTTER DIA  %0.2f)",v[14]);
            //code(v[14],30,"A  ");
            //fprintf(stream,")");
            fprintf(stream,"\n(MACHINE  : HTC 600)");
   fprintf(stream,"\n(LAYOUT NO 2-435,EQUIP. CODE 624,WORK CENTER NO 2621)");
            fprintf(stream,"\n(CONTROL  : SINUMERIK 8M)");
            fprintf(stream,"\n(MOUNT PROPER ARBOR AND CUTTER)");
            fprintf(stream,"\n(LOAD TOOL AND ARBOR)");
            fprintf(stream,"\n(CHK PROPER FIXTURE MOUNTING)");
            fprintf(stream,"\n(ENTER ZERO OFFSET IN N1 STORE)");
            fprintf(stream,"\nN0010G0G90G71G94G80G40G64");
            fprintf(stream,"\nN0020L500");
            fprintf(stream,"\n/N0030L60");
             v[5]=(180*atan(v[19]/v[1]))/(3.141);
             v[6]=(180*atan(v[20]/v[1]))/(3.141);

}

void fapt::mf14(){
                                point1(0,0,41);
                                v[7]=v[1];
                                v[21]=v[1]/32;
                                v[50]=v[14]/2;
                                v[51]=v[50]+2;
                                v[52]=v[14]+2;
                                v[53]=(1000*v[15])/(3.141*v[14]);
                                int t=(int)(v[53]+0.5);          //int
                                v[54]=(float)t;
                                v[55]=v[16]*v[54]*0.1;
```

```
v[103]=v[14]+15;
v[104]=v[14]+30;

 strcpy(st,"HTC");
 strcat(st,strupr(str2));
 stream = fopen(st, "w");
 fprintf(stream,"%");
fprintf(stream,"%s",strupr(str2));
 fprintf(stream,"\n(DRG NO. :  %s)",strupr(str3));
 fprintf(stream,"\n(BLADE  :   %s)",strupr(str4));
if(v[3]==111||v[3]==101)
 mf4();
else if(v[3]==110||v[3]==100)
 mf5();
else if(v[3]==211||v[3]==201)
 mf6();
else if(v[3]==210||v[3]==200)
 mf7();
else
  fprintf(stream,"ERROR IN DATA INPUT. PLEASE CHECK THE VALUES");
}


void fapt::mf6(){

if(v[3]==211)
{
v[10]=v[10]+0.3;
v[11]=v[11]+0.3;
v[12]=v[12]+0.7;
v[13]=v[13]+0.7;
v[19]=v[12]-v[13];
v[20]=v[10]-v[11];
v[27]=-1;
fprintf(stream,"\n(PROG LH GUIDE SUCTION SIDE)");
}
else
{
v[10]=v[10]-0.2;
```

```
            v[11]=v[11]-0.2;
            v[12]=v[12]+0.2;
            v[13]=v[13]+0.2;
            v[19]=v[13]-v[12];
            v[20]=v[11]-v[10];
            v[27]=1;
            fprintf(stream,"\n(PROG LH MOVING SUCTION SIDE)");
            }

mf3();
v[22]=cos((3.141*v[5])/180);
v[23]=90-v[2] ;
v[24]=-1;
v[25]=1;
v[26]=v[24]*v[25];
v[28]=v[26]*(v[27]*v[5]);
v[29]=v[12]-v[13];
v[40]=fabs(v[5]);
v[56]=(v[26]*v[22])/v[21];
v[78]=v[25]/v[21];
v[47]=v[28];
v[48]=1;
v[49]=(v[26]*v[27])*v[6];
sflag =1;
incr=40;
mf12();
seqn();
fprintf(stream,"G0G90G55B0");
point1(v[104],270,43);
seqn();
fprintf(stream,"G55X%ldY%ldZ500000",rnd(p[43].x),rnd(p[43].y));
mf13();
seqn();
fprintf(stream,"L600");
v[28]=v[49];
v[29]=v[10]-v[11];
v[40]=fabs(v[6]);
v[47]=180+v[28];
v[48]=2;
```

```
                seqn();
                fprintf(stream,"G0G90G57");
                mf13();
                seqn();
                fprintf(stream,"L500");
                oflag=1;
                seqn();
                fprintf(stream,"L60");
                seqn();
                fprintf(stream,"M0(CHECKING OF JOB BY QC)");
                oflag=0;
seqn();
                fprintf(stream,"M02");
                sflag=0;
                fprintf(stream,"\n%SP");
                 fprintf(stream,"\nL0100");
                 fprintf(stream,"\n(SUB PROG FOR ROOT END)");
                mf1();
                sflag=1;
                incr =10;
                point1(v[103],250,42);
                p[44].x=c[1].p.x+c[1].r;
                p[44].y=c[1].p.y;
                seqn();
                fprintf(stream,"G42D60");
                fprintf(stream,"G90G00X%ldY%ld",rnd(p[42].x),rnd(p[42].y));
                seqn();
                fprintf(stream,"X%ldY%ld",rnd(p[42].x-10),rnd(p[42].y-240));
                seqn();
                fprintf(stream,"M3M7");
                sflag=0;
                code(v[54],-30,"S");
                sflag=1;
                v[100]=p[44].x;
                v[101]=p[44].y;
                v[102]=v[101]-v[50]-2;
                seqn();
                fprintf(stream,"Y%ld",rnd(v[102]));
                seqn();
```

```
fprintf(stream,"G01X%ldF00%ld",rnd(p[44].x),(long int)v[55]);
seqn();
fprintf(stream,"Y%ld",rnd(p[44].y));
c_rotation(c[1],"CCW",p[23]);
int pindex=24;
for(int i=2;i<15;i++)
 c_rotation(c[i],pindex++);
seqn();
fprintf(stream,"G01X%ldY%ld",rnd(p[45].x),rnd(p[45].y));
seqn();
fprintf(stream,"G00X%ldM9",rnd(p[45].x-v[52]));
seqn();
fprintf(stream,"Y260000");
seqn();
fprintf(stream,"D0Y265000");
sflag=0;
fprintf(stream,"\nM17\nL0200\n(SUB PROG FOR SHROUND END)");
v[22]=cos((v[6]*3.141)/180);
v[23]=-v[23];
v[56]=(-1)*(v[22]*v[26])/v[21];
mf1();
sflag=1;
incr=10;
point1(-v[103],250,42);
p[44].x=c[1].p.x-c[1].r;
p[44].y=c[1].p.y;
seqn();
fprintf(stream,"G41D70X%ldY%ld",rnd(p[42].x),rnd(p[42].y));
seqn();
fprintf(stream,"X%ldY%ld",rnd(p[42].x+10),rnd(p[42].y-240));
seqn();
fprintf(stream,"M3M7");
sflag=0;
code(v[54],-30,"S");
sflag=1;
seqn();
fprintf(stream,"Y%ld",rnd(v[102]));
seqn();
fprintf(stream,"G01X%ld",rnd(p[44].x));
```

```
                seqn();
                fprintf(stream,"Y%ld",rnd(p[44].y));
                c_rotation(c[1],"CW",p[23]);
                pindex=24;
                for(i=2;i<15;i++)
                c_rotation(c[i],pindex++);
                seqn();
                fprintf(stream,"GO1X%ldY%ld",rnd(p[45].x),rnd(p[45].y));
                seqn();
                fprintf(stream,"G00X%ldM9",rnd(p[45].x+v[52]));
                seqn();
                fprintf(stream,"Y260000");
                seqn();
                fprintf(stream,"D0Y%ld",rnd(265));
                sflag=0;
                fprintf(stream,"\nM17\nM02");

  }

void fapt::mf7(){

                        if(v[3]==210)
                        {
                        v[10]=v[10]+0.3 ;
                        v[11]=v[11]+0.3;
                        v[12]=v[12]+0.7;
                        v[13]=v[13]+0.7;
                        v[19]=v[12]-v[13];
                        v[20]=v[10]-v[11];
                        v[27]=-1;
                        fprintf(stream,"\n(PROG LH MOVING PRESSURE SIDE)");
                        }
                        else
                        {
                        v[10]=v[10]-0.2;
                        v[11]=v[11]-0.2;
                        v[12]=v[12]+0.2;
                        v[13]=v[13]+0.2;
                        v[19]=v[13]-v[12];
```

```
            v[20]=v[11]-v[10];
            v[27]=1;
            fprintf(stream,"\n(PROG LH GUIDE PRESSURE SIDE)") ;
            }
mf3();
v[22]=cos((v[5]*3.141)/180);
v[23]=90-v[2] ;
v[24]=-1;
v[25]=-1;
v[26]=v[24]*v[25];
v[28]=v[26]*(v[27]*v[5]);
v[29]=v[12]-v[13];
v[40]=fabs(v[5]);
v[56]=(v[26]*v[22])/v[21];
v[78]=v[25]/v[21];
v[47]=v[28];
v[48]=1;
v[49]=v[26]*v[27]*v[6];
sflag =1;
incr=40;
mf12();
seqn();
fprintf(stream,"G0G90G55B0");
point1(-v[104],270,43);
seqn();
fprintf(stream,"G55X%ldY%ldZ500000",rnd(p[43].x),rnd(p[43].y));
mf13();
seqn();
fprintf(stream,"L600");
v[28]=v[49];
v[29]=v[10]-v[11];
v[40]=fabs(v[6]);
v[47]=180+v[28];
v[48]=2;
seqn();
fprintf(stream,"G0G90G57");
mf13();
seqn();
fprintf(stream,"L500");
```

```
oflag=1;
seqn();
fprintf(stream,"L60");
seqn();
fprintf(stream,"M0(CHECKING OF JOB BY QC)");
oflag=0;
seqn();
fprintf(stream,"M02");
sflag=0;
fprintf(stream,"\n%SP\nL0100\n(SUB PROG FOR ROOT END)");
mf2();
sflag=1;
incr =10;
point1(-v[103],250,42);
p[44].x=c[1].p.x-c[1].r;
p[44].y=c[1].p.y;
seqn();
fprintf(stream,"G41D60");
fprintf(stream,"G90G00X%ldY%ld",rnd(p[42].x),rnd(p[42].y));
seqn();
fprintf(stream,"X%ldY%ld",rnd(p[42].x+10),rnd(p[42].y-240));
seqn();
fprintf(stream,"M3M7");
sflag=0;
code(v[54],-30,"S");
sflag=1;
v[100]=p[44].x;
v[101]=p[44].y;
v[102]=(v[101]-v[50])-1;
seqn();
fprintf(stream,"Y%ld",rnd(v[102]));
seqn();
fprintf(stream,"G01X%ldF00%ld",rnd(p[44].x),(long int)v[55]);
seqn();
fprintf(stream,"Y%ld",rnd(p[44].y));
c_rotation(c[1],"CW",p[25]);
c_rotation(c[2],26,25);
c_rotation(c[3],28,26);
c_rotation(c[4],30,28);
```

```
c_rotation(c[5],31,30);
seqn();
fprintf(stream,"G03X%ldY%ldI%ldJ%ld",rnd(p[35].x),rnd(p[35].y),rnd(c[13].p.x-p[31].x),rnd(c[13].p.y-p[31].y));
c_rotation(c[14],36);
c_rotation(c[15],37);
c_rotation(c[16],38);
c_rotation(c[17],39);
seqn();
fprintf(stream,"G01X%ldY%ld",rnd(p[45].x),rnd(p[45].y));
seqn();
fprintf(stream,"G00Y260000M9");
seqn();
fprintf(stream,"D0Y265000");
sflag=0;
fprintf(stream,"\nM17\nL0200\nSUB PROG FOR SHROUND END)");
v[22]=cos((3.141*v[6])/180);
v[23]=-v[23];
v[56]=(-1)*(v[22]*v[26])/v[21];
mf2();
sflag=1;
incr=10;
point1(v[103],250,42);
p[44].x=c[1].p.x+c[1].r;
p[44].y=c[1].p.y;
seqn();
fprintf(stream,"G42D70X%ldY%ld",rnd(p[42].x),rnd(p[42].y));
seqn();
fprintf(stream,"X%ldY%ld",rnd(p[42].x-10),rnd(p[42].y-240));
seqn();
fprintf(stream,"M3M7");
sflag=0;
code(v[54],-30,"S");
sflag=1;
seqn();
fprintf(stream,"Y%ld",rnd(v[102]));
seqn();
fprintf(stream,"G01X%ld",rnd(p[44].x));
seqn();
fprintf(stream,"Y%ld",rnd(p[44].y));
```

```
                seqn();
                fprintf(stream,"G03X%ldY%ldI%ld",rnd(p[25].x),rnd(p[25].y),rnd(c[1].p.x-p[44].x));
                c_rotation(c[2],26,25);
                c_rotation(c[3],28,26);
                c_rotation(c[4],30,28);
                c_rotation(c[5],31,30);
                seqn();
                fprintf(stream,"G02X%ldY%ldI%ldJ%ld",rnd(p[35].x),rnd(p[35].y),rnd(c[13].p.x-p[31].x),rnd(c[13].p.y-p[31].y));
                c_rotation(c[14],36);
                c_rotation(c[15],37);
                c_rotation(c[16],38);
                c_rotation(c[17],39);
                seqn();
                fprintf(stream,"G01X%ldY%ld",rnd(p[45].x),rnd(p[45].y));
                seqn();
                fprintf(stream,"G00Y260000M9");
                seqn();
                fprintf(stream,"D0Y%ld",rnd(265));
                sflag=0;
                fprintf(stream,"\nM17\nM02");
 }

void fapt::mf4(){

                        if(v[3]==111)
                        {
                        v[10]=v[10]+0.3;
                        v[11]=v[11]+0.3;
                        v[12]=v[12]+0.7;
                        v[13]=v[13]+0.7;
                        v[19]=v[12]-v[13];
                        v[20]=v[10]-v[11];
                        v[27]=-1;
                        fprintf(stream,"\n(PROG RH MOVING SUCTION SIDE)");
                        }
                        else
                        {
                        v[10]=v[10]-0.2;
                        v[11]=v[11]-0.2;
```

```
        v[12]=v[12]+0.2;
        v[13]=v[13]+0.2;
        v[19]=v[13]-v[12];
        v[20]=v[11]-v[10];
        v[27]=1;
        fprintf(stream,"\n(PROG RH GUIDE SUCTION SIDE)");
        }

mf3();
v[22]=cos((3.141*v[5])/180);
v[23]=v[2]-90 ;
v[24]=1;
v[25]=1;
v[26]=v[24]*v[25];
v[28]=v[26]*(v[27]*v[5]);
v[29]=v[12]-v[13];
v[40]=fabs(v[5]);
v[56]=(v[26]*v[22])/v[21];
v[78]=v[25]/v[21];
v[47]=v[28];
v[48]=1;
v[49]=(v[26]*v[27])*v[6];
sflag =1;
incr=40;
mf12();
seqn();
fprintf(stream,"G0G90G55B0");
point1(-v[104],270,43);
seqn();
fprintf(stream,"G55X%ldY%ldZ500000",rnd(p[43].x),rnd(p[43].y));
mf13();
seqn();
fprintf(stream,"L600");
v[28]=v[49];
v[29]=v[10]-v[11];
v[40]=fabs(v[6]);
v[47]=180+v[28];
v[48]=2;
seqn();
```

```
fprintf(stream,"G0G90G57");
mf13();
seqn();
fprintf(stream,"L500");
oflag=1;
seqn();
fprintf(stream,"L60");
seqn();
fprintf(stream,"M0(CHECKING OF JOB BY QC)");
oflag=0;
seqn();
fprintf(stream,"M02");
sflag=0;
fprintf(stream,"\n%SP\nL0100\n(SUB PROG FOR ROOT END)");
mf1();
sflag=1;
incr =10;
point1(-v[103],250,42);
p[44].x=c[1].p.x-c[1].r;
p[44].y=c[1].p.y;
seqn();
fprintf(stream,"G41D60");
fprintf(stream,"G90G00X%ldY%ld",rnd(p[42].x),rnd(p[42].y));
seqn();
fprintf(stream,"X%ldY%ld",rnd(p[42].x+10),rnd(p[42].y-240));
seqn();
fprintf(stream,"M3M7");
sflag=0;
code(v[54],-30,"S");
sflag=1;
v[100]=p[44].x;
v[101]=p[44].y;
v[102]=v[101]-v[50]-2;
seqn();
fprintf(stream,"Y%ld",rnd(v[102]));
seqn();
fprintf(stream,"G01X%ldF00%ld",rnd(p[44].x),(long int)v[55]);
seqn();
fprintf(stream,"Y%ld",rnd(p[44].y));
```

```
c_rotation(c[1],"CW",p[23]);
int pindex=24;
for(int i=2;i<15;i++)
 c_rotation(c[i],pindex++);
seqn();
fprintf(stream,"G01X%ldY%ld",rnd(p[45].x),rnd(p[45].y));
seqn();
fprintf(stream,"G00X%ldM9",rnd(p[45].x+v[52]));
seqn();
fprintf(stream,"Y%ld",rnd(260));
seqn();
fprintf(stream,"D0Y%ld",rnd(265));
sflag=0;
fprintf(stream,"\nM17\nL0200\n(SUB PROG FOR SHROUND END)");
v[22]=cos((v[6]*3.141)/180);
v[23]=-v[23];
v[56]=(-1)*(v[22]*v[26])/v[21];
mf1();
sflag=1;
incr=10;
point1(v[103],250,42);
p[44].x=c[1].p.x+c[1].r;
p[44].y=c[1].p.y;
seqn();
fprintf(stream,"G42D70X%ldY%ld",rnd(p[42].x),rnd(p[42].y));
seqn();
fprintf(stream,"X%ldY%ld",rnd(p[42].x-10),rnd(p[42].y-240));
seqn();
fprintf(stream,"M3M7");
sflag=0;
code(v[54],-30,"S");
sflag=1;
seqn();
fprintf(stream,"Y%ld",rnd(v[102]));
seqn();
fprintf(stream,"G01X%ld",rnd(p[44].x));
seqn();
fprintf(stream,"Y%ld",rnd(p[44].y));
c_rotation(c[1],"CCW",p[23]);
```

```
		pindex=24;
		for(i=2;i<15;i++)
		c_rotation(c[i],pindex++);
		seqn();
		fprintf(stream,"G01X%ldY%ld",rnd(p[45].x),rnd(p[45].y));
		seqn();
		fprintf(stream,"G00X%ldM9",rnd(p[45].x-v[52]));
		seqn();
		fprintf(stream,"Y260000");
		seqn();
		fprintf(stream,"D0Y265000");
		sflag=0;
		fprintf(stream,"\nM17\nM02");
}

	void fapt::mf5(){

			if(v[3]==110)
			{
			v[10]=v[10]+0.3;
			v[11]=v[11]+0.3;
			v[12]=v[12]+0.7;
			v[13]=v[13]+0.7;
			v[19]=v[12]-v[13];
			v[20]=v[10]-v[11];
			v[27]=-1;
			fprintf(stream,"\n(PROG RH MOVING  PRESSURE SIDE)");
			}
			else
			{
			v[10]=v[10]-0.2;
			v[11]=v[11]-0.2;
			v[12]=v[12]+0.2;
			v[13]=v[13]+0.2;
			v[19]=v[13]-v[12];
			v[20]=v[11]-v[10];
			v[27]=1;
			fprintf(stream,"\n(PROG RH GUIDE PRESSURE SIDE)");
			}
```

```
mf3();
v[22]=cos((3.141*v[5])/180);
v[23]=v[2]-90 ;
v[24]=1;
v[25]=-1;
v[26]=v[24]*v[25];
v[28]=v[26]*(v[27]*v[5]);
v[29]=v[12]-v[13];
v[40]=fabs(v[5]);
v[56]=(v[26]*v[22])/v[21];
v[78]=v[25]/v[21];
v[47]=v[28];
v[48]=1;
v[49]=(v[26]*v[27])*v[6];
sflag =1;
incr=40;
mf12();
seqn();
fprintf(stream,"G0G90G55B0");
point1(v[104],270,43);
seqn();
fprintf(stream,"G55X%ldY%ldZ500000",rnd(p[43].x),rnd(p[43].y));
mf13();
seqn();
fprintf(stream,"L600");
v[28]=v[49];
v[29]=v[10]-v[11];
v[40]=fabs(v[6]);
v[47]=180+v[28];
v[48]=2;
seqn();
fprintf(stream,"G0G90G57");
mf13();
seqn();
fprintf(stream,"L500");
oflag=1;
seqn();
fprintf(stream,"L60");
```

```
        seqn();
fprintf(stream,"M0(CHECKING OF JOB BY QC)");
oflag=0;
seqn();
fprintf(stream,"M02");
sflag=0;
fprintf(stream,"\n%SP\nL0100\n(SUB PROG FOR ROOT END)");
mf2();
sflag=1;
incr =10;
point1(v[103],250,42);
p[44].x=c[1].p.x+c[1].r;
p[44].y=c[1].p.y;
seqn();
fprintf(stream,"G42D60");
fprintf(stream,"G90G00X%ldY%ld",rnd(p[42].x),rnd(p[42].y));
seqn();
fprintf(stream,"X%ldY%ld",rnd(p[42].x-10),rnd(p[42].y-240));
seqn();
fprintf(stream,"M3M7");
sflag=0;
code(v[54],-30,"S");
sflag=1;
v[100]=p[44].x;
v[101]=p[44].y;
v[102]=v[101]-v[50]-1;
seqn();
fprintf(stream,"Y%ld",rnd(v[102]));
seqn();
fprintf(stream,"G01X%ldF00%ld",rnd(p[44].x),(long int)v[55]);
seqn();
fprintf(stream,"Y%ld",rnd(p[44].y));
seqn();
fprintf(stream,"G03X%ldY%ldI%ld",rnd(p[25].x),rnd(p[25].y),rnd(c[1].p.x-p[44].x));
c_rotation(c[2],26,25);
c_rotation(c[3],28,26);
c_rotation(c[4],30,28);
c_rotation(c[5],31,30);
seqn();
```

```
fprintf(stream,"G02X%ldY%ldI%ldJ%ld",rnd(p[35].x),rnd(p[35].y),rnd(c[13].p.x-p[31].x),rnd(c[13].p.y-p[31].y));
c_rotation(c[14],36);
c_rotation(c[15],37);
c_rotation(c[16],38);
c_rotation(c[17],39);
seqn();
fprintf(stream,"G01X%ldY%ld",rnd(p[45].x),rnd(p[45].y));
seqn();
fprintf(stream,"G00Y%ldM9",rnd(260));
seqn();
fprintf(stream,"D0Y%ld",rnd(265));
sflag=0;
fprintf(stream,"\nM17\nL0200\n(SUB PROG FOR SHROUND END)");
v[22]=cos((v[6]*3.141)/180);
v[23]=-v[23];
v[56]=(-1)*(v[22]*v[26])/v[21];
mf2();
sflag=1;
incr=10;
point1(-v[103],250,42);
p[44].x=c[1].p.x-c[1].r;
p[44].y=c[1].p.y;
seqn();
fprintf(stream,"G41D70X%ldY%ld",rnd(p[42].x),rnd(p[42].y));
seqn();
fprintf(stream,"X%ldY%ld",rnd(p[42].x+10),rnd(p[42].y-240));
seqn();
fprintf(stream,"M3M7");
sflag=0;
code(v[54],-30,"S");
sflag=1;
seqn();
fprintf(stream,"Y%ld",rnd(v[102]));
seqn();
fprintf(stream,"G01X%ld",rnd(p[44].x));
seqn();
fprintf(stream,"Y%ld",rnd(p[44].y));
c_rotation(c[1],"CW",p[25]);
c_rotation(c[2],26,25);
```

```
                    c_rotation(c[3],28,26);
                    c_rotation(c[4],30,28);
                    c_rotation(c[5],31,30);
                    seqn();
                    fprintf(stream,"G03X%ldY%ldI%ldJ%ld",rnd(p[35].x),rnd(p[35].y),rnd(c[13].p.x-p[31].x),rnd(c[13].p.y-p[31].y));
                    c_rotation(c[14],36);
                    c_rotation(c[15],37);
                    c_rotation(c[16],38);
                    c_rotation(c[17],39);
                    seqn();
                    fprintf(stream,"G01X%ldY%ld",rnd(p[45].x),rnd(p[45].y));
                    seqn();
                    fprintf(stream,"G00Y%ldM9",rnd(260));
                    seqn();
                    fprintf(stream,"D0Y265000");
                    sflag=0;
                    fprintf(stream,"\nM17\nM02");
 }

int fapt::menu(){
                                          str1="LPMS01L";
                                          str3="2-103-06-41001 REV 00";

                                          str2="1000  ";
                                          str4="T2-45-55 ST01L";
                                          v[1]=45;v[2]=55.5;v[3]=201;v[4]=2.48;v[8]=0;
                                          v[9]=27.68;v[10]=187.5;v[11]=200.1;v[12]=71.1;
                                          v[13]=75.7;v[14]=140;v[15]=80;v[16]=14;
                                         textbackground(1);
                                         textcolor(14);
                                         clrscr();

  show();
char ch;
int i;
float j;
gotoxy(5,21);
cout<<"CHECK VALUES CAREFULLY - DO YOU WANT TO MODIFY ANY VALUE.(y/n)--";
cin>>ch;
```

```
while((ch=='y'||ch=='Y')){
gotoxy(20,22);
cout<<"PLEASE ENTER THE  LINE NO.=";
line :cin>>j;
i=(int)j;
clrscr();
show();
switch(i){

case 0: clrscr();
                        show();
                        gotoxy(5,21);
                        cout<<"CHECK VALUES CAREFULLY - DO YOU WANT TO MODIFY ANY VALUE.(y/n)--";
                        cin>>ch;
                        if(ch=='n'||ch=='N')
                        goto me;
                                break;

case 1:  gotoxy(20,23);
                                cout<< "1.PART FILENAME" <<"@     " ;
                                gets(str1);
                                clrscr();
                                show();
                                break;
case 2:  gotoxy(20,23);
                                cout<<"2.PROGRAM NUMBER" <<"@%    ";
                                gets(str2);
                                clrscr();
                                show();
                                break;

case 3:  gotoxy(20,23);
                                cout<<"3.@ DRG NO :       " ;gets(str3);
                                clrscr();
                                show();
                                break;
case 4:  gotoxy(20,23);
                                cout<< "4.BLADE SPECIFICATION @ BLADE :     " ;  gets(str4);
                                clrscr();
```

```
                        show();
                        break;

case 5:  gotoxy(20,23);
                        cout<<"5.BLADE PROFILE FORM          V1=";
                        cin>>v[1];
                        clrscr();
                        show();
                        break;
case 6:  gotoxy(20,23);
                        cout<<"6.BLADE ANGLE                 V2=";
                        cin>>v[2];
                        clrscr();
                        show();
                        break;

case 7:  gotoxy(20,23);
                         cout<<"7.BLADE IDENTF. NO FROM DATA SHEET V3=";
                         cin>>v[3];
                         clrscr();
                        show();
                        break;
case 8:  gotoxy(20,23);
                        cout<<"8.DEPTH OF CUT FOR ROUGHING     V4=";
                        cin>>v[4];
                        clrscr();
                        show();
                        break;
case 9:  gotoxy(20,23);
                        cout<<"9.VALUE OF D FROM DATA SHEET    V8=";
                        cin>>v[8];
                        clrscr();
                        show();
                        break;
case 10: gotoxy(20,23);
                        cout<<"10.VALUE OF UH FROM DATA SHEET  V9=";
                         cin>>v[9];
                         clrscr();
                        show();
```

```
                        break;

case 11: gotoxy(20,23);
                        cout<<"11.D1 OR S1 FROM DRG          V10=";
                        cin>>v[10];
                        clrscr();
                        show();
                        break;
case 12: gotoxy(20,23);
                        cout<<"12.D3 OR S3 FROM DRG          V11=";
                         cin>>v[11];
                         clrscr();
                        show();
                        break;
case 13: gotoxy(20,23);
                         cout<<"13.D4 OR S4 FROM DRG          V12=";
                         cin>>v[12];
                         clrscr();
                        show();
                        break;
case 14: gotoxy(20,23);
                        cout<<"14.D6 OR S6 FROM DRG          V13=";
                        cin>>v[13];
                        clrscr();
                        show();
                        break;

case 15:gotoxy(20,23);
                cout<<"15.DIA OF CUTTER FROM DATA SHEET  V14=";
                cin>>v[14];
                clrscr();
                        show();
                        break;
case 16:gotoxy(20,23);
                cout<<"16.CUTTING SPEEED IN M/MIN       V15=";
                cin>>v[15];
                clrscr();
                        show();
                        break;
```

```
case 17:gotoxy(20,23);
                                cout<<"17.NO OF TEETH ON CUTTER         V16=";
                                 cin>>v[16];
                                 clrscr();
                                show();
                                break;
default:

                                gotoxy(20,23);
                                cout<<"PLEASE ENTER THE CORRECT LINE NO.= ";
                        goto line;

 }
/*gotoxy(5,21);
cout<<"CHECK VALUES CAREFULLY - DO YOU WANT TO MODIFY ANY VALUE.(y/n)--";
 cin>>ch;*/

}
 me : mf14();
  char ano;
  process();
  fclose(stream);
  textbackground(1);
  textcolor(15);
  clrscr();
  gotoxy(20,12);
  cout<<"\n\n\tYOUR OUTPUT IS STORED IN FILE---->  "<<st;
  gotoxy(30,15);
  cout<<"\n\n\tDO YOU WANT TO ENTER ANOTHER DATA(Y/N)--";
  //fflush(stdin);
  cin>>ano;
  if(ano=='y'||ano=='Y')
  menu();
  return 0;
}



void fapt::show(){
```

```
cout<<"**************************DATA ENTRY FROM**********************************";
gotoxy(1,24);
cout<<"*******************************************************************************";
gotoxy(1,2);
cout<<"\n0.EXIT EDITING BY LINE NUMBER";
cout<< "\n1.PART FILENAME" <<"@        " ;
cout<< strupr(str1);
cout<<"\n2.PROGRAM NUMBER" <<"@%        ";
cout<<strupr(str2);
cout<<"\n3.@ DRG NO :                 " ;
cout<<strupr(str3);
cout<< "\n4.BLADE SPECIFICATION @ BLADE :";
cout<<strupr(str4);
cout<<"\n5.BLADE PROFILE FORM                V1=";
cout<<v[1];
cout<<"\n6.BLADE ANGLE                      V2=";
cout<<v[2];
cout<<"\n7.BLADE IDENTF. NO FROM DATA SHEET     V3=";
cout<<v[3];
cout<<"\n8.DEPTH OF CUT FOR ROUGHING           V4=";
cout<<v[4];
cout<<"\n9.VALUE OF D FROM DATA SHEET          V8=";
cout<<v[8];
cout<<"\n10.VALUE OF UH FROM DATA SHEET        V9=";
cout<<v[9];
cout<<"\n11.D1 OR S1 FROM DRG                V10=";
cout<<v[10];
cout<<"\n12.D3 OR S3 FROM DRG                V11=";
cout<<v[11];
cout<<"\n13.D4 OR S4 FROM DRG                V12=";
cout<<v[12];
cout<<"\n14.D6 OR S6 FROM DRG                V13=";
cout<<v[13];
cout<<"\n15.DIA OF CUTTER FROM DATA SHEET      V14=";
cout<<v[14];
cout<<"\n16.CUTTING SPEEED IN M/MIN           V15=";
cout<<v[15];
cout<<"\n17.NO OF TEETH ON CUTTER             V16=";
```

```
cout<<v[16];

}


void  fapt::end()
{
        int gdriver = DETECT, gmode, errorcode;
        initgraph(&gdriver, &gmode, "c:\\tc");
        errorcode = graphresult();
        if (errorcode != grOk) {
                printf("Graphics error: %s\n", grapherrormsg(errorcode));
                printf("Press any key to halt:");
                getch();
                exit(1);
        }   setbkcolor(3);
         setcolor(12);
        setfillstyle(1, 14);
        fillellipse(320,350, 150,75);
        setcolor(4);
        settextstyle(4,0,4);
        outtextxy(200,330,"THANK YOU");
        getch();
        closegraph();
}

void fapt::start(){

        int gdriver = DETECT, gmode, errorcode;
        initgraph(&gdriver, &gmode, "c:\\tc");
        errorcode = graphresult();
         if (errorcode != grOk) {
                printf("Graphics error: %s\n", grapherrormsg(errorcode));
                printf("Press any key to halt:");
                getch();
                exit(1);
        }
        setbkcolor(CYAN);
        setcolor(15);
```

```
            settextstyle(4,0,6);
            /*for(int i=0;i<100;i++){
 cleardevice();

 delay(100);
 }*/
 outtextxy(175,50,"WELCOME")   ;
 setcolor(1);
 settextstyle(1,0,2);
            outtextxy(280,110,"TO");
            outtextxy(250,130,"PROGRAM");
            outtextxy(275,150,"FOR");
            outtextxy(160,170,"GENERATION OF N.C. OUTPUT");
            outtextxy(275,190,"FOR");
            outtextxy(140,210,"T2 FILLET MACHINING ON HTC-600");
            setcolor(4);
            settextstyle(0,0,0);
            outtextxy(200,250,"Completed On :June 28,2K");
            setcolor(14);
            settextstyle(1,0,1);
            outtextxy(310,320,"MADE BY :-");
            settextstyle(3,0,1);
            outtextxy(310,340,"JITENDRA SINGH GANGWAR (K.N.I.T.)");
            outtextxy(310,360,"SANJAY KUMAR ARYA (K.N.I.T.)");
            outtextxy(310,380,"GAURAV GARG (M.I.T.)");
           settextstyle(1,0,1);
           outtextxy(50,320,"GUIDED BY :-");
           settextstyle(3,0,1);
           outtextxy(50,340,"MR. D.K. CHAWLA");
           outtextxy(50,360,"Mgr. (N.C.Tech)");
           setcolor(4);
           settextstyle(1,0,2);
                    outtextxy(310,420,"PRESS ENTER TO CONTINUE...");
           setcolor(14);
           rectangle(10,10,630,470);
           rectangle(20,20,620,460);
           floodfill(15,15,14);
char ch;
do{
```

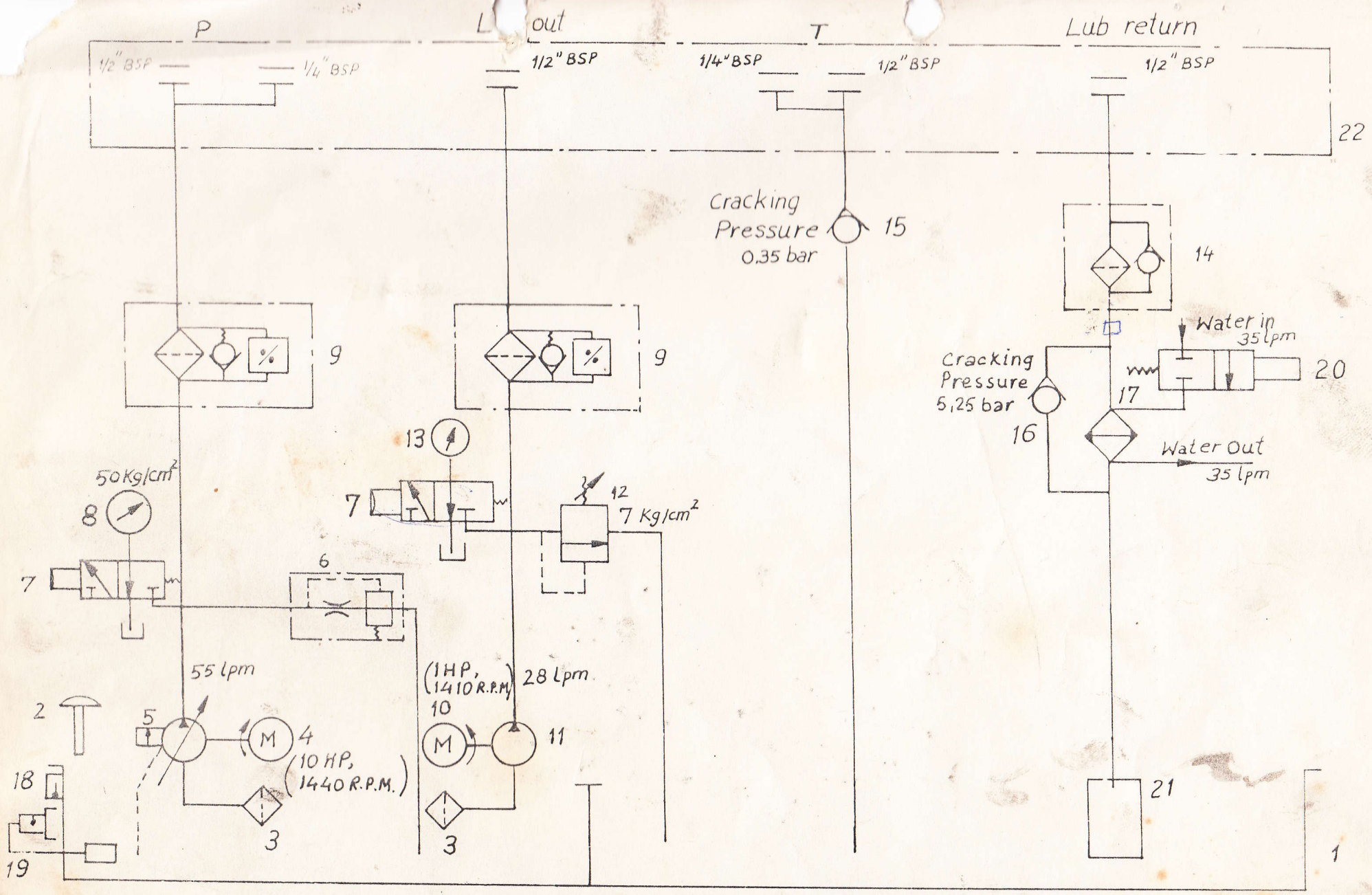
```
 ch=getch();
 }while(ch!=13);
            closegraph();

}


void fapt::process()
{
            int gdriver = DETECT, gmode, errorcode;
            int left, top, right, bottom;
            initgraph(&gdriver, &gmode, "c:\\tc");
            errorcode = graphresult();
            if (errorcode != grOk) {
                        printf("Graphics error: %s\n", grapherrormsg(errorcode));
                        printf("Press any key to halt:");
                        getch();
                        exit(1);
            }

             setbkcolor(CYAN);
             cleardevice();
            settextstyle(TRIPLEX_FONT,0,1);
            outtextxy(50,120,"PROCESS IS GOING ON");
            outtextxy(300,140,"PLEASE WAIT.....");
            left = (getmaxx() / 2) -300;
            top = (getmaxy() / 2) -10;
            right = (getmaxx() / 2) + 300;
            bottom = (getmaxy() / 2) +10;
            rectangle(left,top,right,bottom);
            setfillstyle(SOLID_FILL,1);
            floodfill(50,231,15);
            int right1;
             for(int i=10;i<610;i=i+10)
             {
             right1= left+i;
             rectangle(left,top,right1,bottom);
             setfillstyle(1,4);
             floodfill(15+i,231,15);
```

```
            delay(100);
            }
             settextstyle(3,0,1);
           setcolor(14);
           outtextxy(400,270,"PROCESS COMPLETED..");
 settextstyle(1,0,1);
           //settextstyle(4,0,2);
           setcolor(1);
           outtextxy(320,420,"PRESS ENTER TO CONTINUE....");
           char ch;
            do{
                              ch=getch();
                    }while(ch!=13);
           closegraph();
}
```


P
L out
T
Lub return
1/2" BSP
1/4" BSP
1/2" BSP
1/4" BSP
1/2" BSP
1/2" BSP
22
Cracking Pressure 0.35 bar
15
14
9
9
Water in 35 lpm
Cracking Pressure 5.25 bar
16
17
20
Water Out 35 lpm
13
50 Kg/cm²
8
7
7
12
7 Kg/cm²
6
55 lpm
(1 HP, 1410 R.P.M.)
28 lpm
10
11
2
5
M
4
(10 HP, 1440 R.P.M.)
18
3
3
19
21
1
4-8
HYDRAULIC CIRCUIT FOR HYDRAULIC POWER PACK
Drawn
checked
85/03/26
SKP-117-2188/6

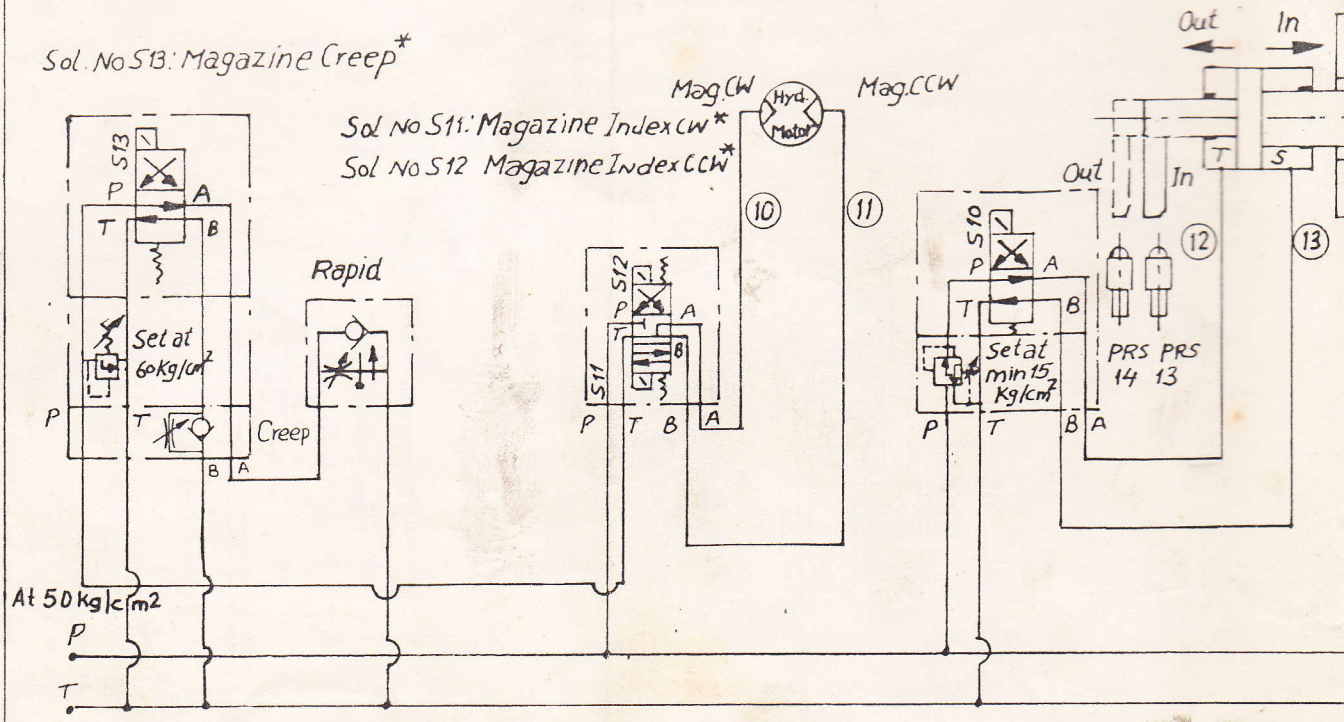
Hyd. Motor : Danfoss OMP-100
Rapid r.p.m. : 120 at 10 lpm.
Creep r.p.m. : 8 at 0.7 lpm.

Cyl. T : cyl. dia - 35 mm
Rod dia - 20 mm
Cyl. S : Cyl. dia - 35 mm
Rod dia - 25 mm

Sol. No S10: Magazine Shot Pin Out*

Sol. No S13: Magazine Creep*

Sol No S11: Magazine Index CW*
Sol No S12 Magazine Index CCW*



Mag. Index

Mag. Shot pi

Sol. No S16: Table Clamp*
Sol. No. S17: Table Unclamp*

Cyl. dia.: 265 mm
Rod dia.: 180 mm
Stroke : 6 mm

Cyl: dia.: 40 mm
Rod dia.: 18 mm
Sol. No 30: Hyd. Oil in Counter balance Cylinders*

Sol No. 15: PDB
Cyl. dia.: 110 m
Rod dia.: 42 m

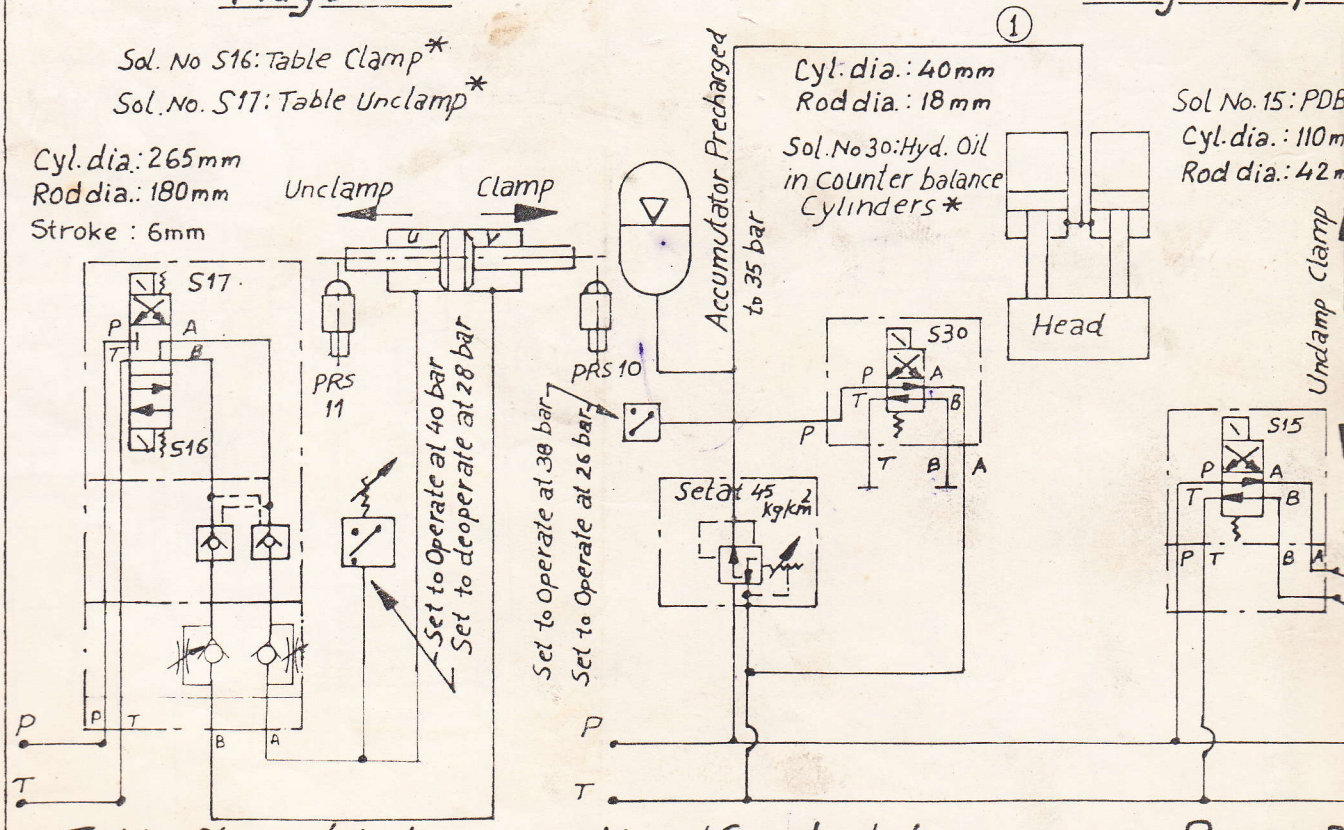


Table Clamp/Unclamp

(Only for Index Table)

Head Counterbalance

POWER D

* Solenoids operation conditions

ANNEXURE-'1'

Certificate by Charted Accountant on Letter Head

This is to certify that M/s …… (hereinafter referred to as 'company') having its registered office at ……is registered under MSMED Act 2006, Entrepreneur Memorandum No. Part –II ……Dtd: …… Category: …… (Micro/ small). (Copy enclosed).

Further verified from Books of account that the investment of the company as per the latest audited financial year…….. as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by Ministry of small scale Industries vide its notification No. S.O. 1722(E) Dtd. October 5 , 2006):
   Rs. …….. Lacs
2. **For Service Enterprises:** Investment in equipments (i.e. original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under MSMED Act, 2006):
   Rs. …….. Lacs

(Strike off whichever is not applicable)

The above investment of Rs…… Lacs is within permissible limit of Rs……Lacs for…… (Micro/ small) (Strike off whichever is not applicable) category under MSMED Act 2006.

Or

The company has graduated from its original capacity (Micro/ small) (Strike off whichever is not applicable) and date of graduation of such enterprise from its original capacity is……. (dd/mm/yy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S. O. No. 3322 (E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by ministry if MSME.

Date:
(Signature)
Name-
Membership No.-
Seal of Chartered accountant

Vendor's Signature & Seal