LIST OF G1-CODE

CODES	FUNCTION	MACHINE
G100	RAPID MOVE	MILL & LATHE
G101	LINIER MOVE	MILL & LATHE
G102	CIRCULAR MOVEMENT CW	MILL & LATHE
G103	CIRCULAR MOVEMENT CCW	MILL & LATHE
G104	DWELL	MILL & LATHE
G115	POLAR COMMAND CANCEL	MILL
G116	POLAR COMMAND ACTIVE	MILL
G117	XY PLANE	MILL & LATHE
G118	ZX PLANE	MILL & LATHE
G119	YZ PLANE	MILL & LATHE
G120	INCH MODE	MILL & LATHE
G121	METRIC MODE	MILL & LATHE
G28	RETURN TO REFERNCE POINT	MILL & LATHE
G31	SKIP FUNCTION	MILL & LATHE
G33	THREAD CUTTING	MILL & LATHE
G40	CUTTER COMPENSATION CANCEL	MILL & LATHE
G41	CUTTER COMPENSATION LEFT	MILL & LATHE
G42	CUTTER COMPENSATION RIGHT	MILL & LATHE
G43	TOOL LENGTH COMPENSATION +VE DIRECTION	MILL & LATHE
G44	TOOL LENGTH COMPENSATION -VE DIRECTION	MILL & LATHE
G49	TOOL LENGTH COMPENSATION CANCEL	MILL
G150	SCALING OFF	MILL
G151	SCALING ON	MILL
G152	DATUM SHIFT	MILL
G153	MACHINE CO-ORDINATE SYSTEM SETTING	MILL & LATHE
G154	WORK CO-ORDINATE SYSTEM - 01	MILL & LATHE
G155	WORK CO-ORDINATE SYSTEM - 02	MILL & LATHE
G156	WORK CO-ORDINATE SYSTEM - 03	MILL & LATHE
G157	WORK CO-ORDINATE SYSTEM - 04	MILL & LATHE
G158	WORK CO-ORDINATE SYSTEM - 05	MILL & LATHE
G159	WORK CO-ORDINATE SYSTEM - 06	MILL & LATHE
G68	ROTATION ON	MILL

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G69	ROTATION OFF	MILL
G70	FINISHING CYCLE	LATHE
G71	OD/ID STOCK REMOVAL CYCLE (ROUGH TURNING)	LATHE
G72	FACE STOCK REMOVAL CYCLE (PROFILE TURNING)	LATHE
G73	INREGULAR PATH STOCK REMOVAL CYCLE	LATHE
G74	FACE GROOVING CYCLE, PECK DRILLING	LATHE
G75	AXIAL GROOVING CYCLE	LATHE
G76	THREAD CUTTING CYCLE (MULTIPLE PASS)	LATHE
G80	CANNED CYCLE CANCEL	MILL & LATHE
G82	SPOT DRILL CYCLE	MILL & LATHE
G83	PECT DRILL CYCLE	MILL & LATHE
G84	TAPPING CYCLE	MILL & LATHE
G85	BORING CYCLE WITH FEED RETRACTION	MILL
G90	ABSOLUTE CO-ORDINATE SYSTEM	MILL & LATHE
G91	INCREMENTAL CO-ORDINATE SYSTEM	MILL & LATHE
G92	SPINDLE SPEED LIMIT	LATHE
G94	FEED PER MINUTE	MILL
G96	CONSTANT SURFACE SPEED ON	LATHE
G97	CONSTANT SURFACE SPEED CANCEL	LATHE
G98	FEED PER MINUTE	LATHE
G99	FEED PER REVOLUTION	LATHE

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LIST OF M-CODE

CODE	FUNCTION	MACHINE
M00	PROGRAM STOP	MILL & LATHE
M01	OPTIONAL PROGRAM STOP	MILL & LATHE
M02	PROGRAM END	MILL & LATHE
M03	SPINDLE ON CW	MILL & LATHE
M04	SPINDLE ON CCW	MILL & LATHE
M05	SPINDLE STOP	MILL & LATHE
M06	TOOL CHANGE	MILL & LATHE
M07/08	COLLANT ON	MILL & LATHE
M09	COLLANT OFF	MILL & LATHE
M16	CHUCK I.D SELECTION	LATHE
M18	CHUCK O.D SELECTION	LATHE
M19	SPINDLE ORIENTATION	MILL & LATHE
M30	END OF PROGRAM AND REST TO START	MILL & LATHE
M32	TAIL STOCK QUILL FORWARD	LATHE
M33	TAIL STOCK QUILL RETRACT	LATHE
M45	TOOL CLAMP/DECLAMP	MILL
M98	SUB PROGRAM CELL	MILL & LATHE
M99	SUB PROGRAM END	MILL & LATHE
M10	CHUCK DECLAMP	LATHE
M11	CHUCK CLAMP	LATHE

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MEASUREMENT SYSTM AND CONVERSION

1 INCH – 25.4 MM

1CM = 10MM

1 INCH – 2.54CM

1MM – 0.039 INCH

1MM – 0.1 CM

1 MM – 1000 μ

1000 μ – 1mm/0.1cm/10^3 μ

0.5mm – 500 μ

0.2mm – 200 μ

0.1mm – 100 μ

0.09 mm – 90 μ

0.05 mm – 50 μ

0.02 mm – 20 μ

0.01 mm – 10 μ

0.009mm – 9 μ

0.008mm – 8 μ

0.001mm – 1 μ

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CNC TURNING

MACHINE ?-

MACHINE IS A DEVICE WHICH CAN CONVERT ONE FORM OF ENERGY TO ANOTHER FORM OF ENERGY AND SIMULTANEOUSLY REDUCE HUMAN EFFORT.

EXAMPLE ?- FAN, PUMP, WASHING MACHINE ETC.

TOOL ?-

TOOL IS A DEVICE WHICH MAKES OUR WORK EASIER.

EXAMPLE ?- KNIFE, SCREW DRIVER, HAMMER ETC.

MACHINE TOOL ?-

THE MACHINE WHICH CAN PRODUCE ITS OWN (NOT ALL THE PARTS) AS WELL AS OTHER PARTS IS KNOWN AS A MACHINE TOOL.

MACHINE CENTER ?-

IN THIS TYPE OF MACHINE A NUMBER OF OPERATIONS CAN BE CARRIED OUT BY THE HELP OF AUTOMATIC TOOL CHANGER IN A SINGLE SETTING OF WORKPIECE

1. H.M.C — HORIZONTAL MACHINE CENTER
2. V.M.C — VERTICAL MACHINE CENTER

MACHINE PROCESS ?-

IT IS THE PROCESS BY WHICH A REQUIRED SHAPE AND SIZE IS GIVEN TO A RAW MATRICAL BY THE HELP OF MACHINE TOOL.

TYPE OF MACHINE PROCESS ?-

(01) CONVENTIONAL MACHINING PROCESS.

(02) NON CONVENTIONAL MACHINING PROCESS.

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01) CONVENTIONAL MACHINING PROCESS ?-

IT IS THE TYPE OF MACHINING PROCESS IN WHICH THE CUTTING TOOL DIRECTLY TOUCHES THE WORKPIECE IN THIS PROCESS CUTTING TOOL MATRIAL IS ALWAYS HARDER THEN WORK PIECE MATRIAL.

EXAMPLE ?- MILLING M/C, CNC TURNING M/C..

02) NON-CONVENTIONAL MACHINING PROCESS ?-

IT IS THE TYPE OF MACHINING PROCESS IN WHICH THERE IS A GAP BETWEEN THE CUTTING IN THIS PROCESS CUTTING TOOL MATRIAL MAY BE HARDER OR SOFTER THAN THE WORKPIECE MATRIAL.

EXAMPLE ?-

(1) EDM - ELECTRO DISCHARGE MACHINE

(2) LBM - LASER BEAM MACHINE

(3) AJM - ABRASIVE JET MACHINE.

(4) ECM - ELECTRO CHEMICAL MACHINING

LATHE MACHINE ?-

IT IS THE MACHINE TOOL WHICH IS GENERALLY USED TO PRODUCE OR MANUFACTURE CYLINDRICAL OR ROUND TYPES OF JOB IN WHICH (THE WORK PIECE ROTATES AND THE CUTTING TOOL IS FEED ON THE SURFACE OF THE JOB TO GET) DESIRED SHAPE AND SIZE.

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MILLING MACHINE ?-

IT IS A MACHINE TOOL WHICH IS USED TO PRODUCE OR MANUFACTURING FLAT OR IRREGULAR TYPE OF JOB IN WHICH CUTTING TOOL ROTATES AND THE WORKPIECE IS FEED UNDER THE SURFACE OF THE CUTTER TO GET A DISIRED SHAPE AND SIZE.

CNC MACHINE ?-

A MACHINE WHICH IS CONTROLLED BY CERTAIN LETTERS, NUMBERS AND SYMBOLS IN THE FORM OF A PROGRAM BY THE HELP OF COMPUTER IS KNOWN AS CNC MACHINE.

HISTORY of CNC MACHINE ?-

FATHER OF CNC - JOHN T. PERSON

(*) 1949 - USA AIRFORCE DEMANDED TO DEVELOP A NUMERICALLY CONTROLLED MACHINE.

(*) 1952 - PROTOTYPE CNC MACHINE DEMONSTRATED PUNCHED TAPE INPUT.

(*) 1980 - CNC MACHINE COMPUTER USED TO LINK DIRECTLY TO CONTROLLER.

(*) 1990 - DNC EXTERNAL COMPUTER "DRIP FEEDS" CONTROL PROGRAMMIER CONTROL MACHINE.

CONVENTIONAL NUMERICAL CONTROL ?-

IT IS A HARDWARE SYSTEM EMPLOYING INTEGRATED CIRCUITS WHICH ARE PERMANENTLY WIRED AND ARRANGED ON PRINTED CIRCUIT BOARD. ALSO THIS SYSTEM IS PURELY A HARD WIRE BASED SYSTEM. IT IS CONTROL. THERE IS NO PROVISION TO CHANGING FEEDS AND SPEED DURING MACHINE.

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COMPUTER NUMERICAL CONTROL ?-

IT IS A SOFTWARE BASED SYSTEM IN WHICH COMPUTER REPLACES THE CONTROL UNIT of THE NC. IT DOES NOT CARRY THE HARD WIRED LOGIC SYSTEM AND ALL THIS FUNCTIONS CONTROLLING THE MACHINE TOOL IS PERFORMED BY THE SOFTWARE PROGRAMME BY THE COMPUTER. HERE IT IS CALLED MINI COMPUTER.

1 DIRECT NUMERICAL CONTROL ?-

IT IS ALSO A COMPUTERIZED NUMERICAL CONTROL SYSTEM. BUT IT IS DIFFERENT FROM CNC SYSTEM BY EMPLOYING A SAPARATELY LOCATED CONTROL COMPUTER AND DIRECTLY CONTROL SEVERAL MACHINE SIMULTANEOUSLY.

ADVANTAGE OF CNC ?-

(*) EASIER TO PROGRAMMIE.

(*) EASY STORGE OF EXISTING PROGRAMME.

(*) EASY TO CHANGE PROGRAMMIE.

(*) CNC MACHINE ARE SAFER TO OPERATTE.

(*) COMPLICATED GEOMETRY CAN BE PRODUED EASILY.

(*) USUALLY GENERATES CLOSER TOLERANCE THAN THE MANUAL MACHINE.

(*) IT IS MOST SUITABLE FOR MASS PRODUCTION OR BATCH PRODUTION.

(*) LESS MAN POWER IS REQUIRED FOR PRODUCING THE JOB.

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LIMITATION OF CNC ?-

COMPONATIVELY HIGH PRICE FOR THE CNC MACHINE.

(*) MORE COMPLICATED MAINTAINANCCE FOR WHICH SPACIAL MAINTAINANCCE CREW IS DESIRED.

(*) A HIGHLY SKILLED AND PROPERLY TRAINED PROGIRAMMED IS NEEDED.

(*) MORE SPACE IS REQUIRED FOR INSTALLATION

→ MOTORS USED IN CNC TURNING MACHINE.

(*) SERVO MOTOR ?-

USED IN X AND Z AXIS MOVEMENT SPINDLE ROTATION.

(*) INDUCTION MOTOR ?-

COLLANT, LUBRICATING OIL, HYDRAULIC OIL,

(*) STEPPER MOTOR ?-

TURRET ROTATION.

MECHANISM OF CNC MACHINE ?-

CONTROLLER → SERVOMOTOR → LEAD SCREW ROTATION → TABLE MOVES → POSITION SENSED BY ENCODER

FEEDBACK

(*) CHUCK CLAMP/DECLAMP, TAILSTOCK QUILL F/R - HYDROLIC MECHANISM

(*) CNC MACHINE AXIS MOVEMENT - BALL LEAD SCREW SERVO MECHANISM

(*) CNC MILLING SPINDLE ROTATION - DIRECT DRIVE MECHANISM

(*) LATHE SPINDLE ROTATION - BELT PULLAY DRIVE MACHANISM

(*) TURRET ROTATION :- OIL BATH ROBUST MECHANISM

PROGIRAMME LANGUAGE ?-

(*) ISO MODE PROGIRAMME LANGUAGE.

(*) DIALOGUE MODE PROGIRAMM LANGUAGE.

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CONTROLLER?-

01) FANUC

02) SINUMERIC

03) HEIDENHEIN

04) MAZATROL

05) MITSUBISHI

06) FAGHOR

07) HASS

08) LAXMI NUMERIC

CODE USED IN CNC PROGRAMMING?-

S CODE – SPINDLE SPEED

T CODE – TOOL CHANGE

F CODE – FEED RATE

R CODE – RADIUS VALUE

G CODE – PREPARATORY CODE

M CODE – MISCELLANEOUS CODE

CUTTING SPEED?-

THE SPEED AT WHICH THE MATRIAL IS REMOVED FROM THE SURFACE OF WORK PIECE IS KNOWN AS CUTTING SPEED.

OR DISTANCE TRAVELLED BY THE TOOL OVER THE SURFACE OF THE WORKPIECE IN ONE MINUTE IS KNOWN AS CUTTING SPEED.

$$\text{CUTTING SPEED} = \frac{\pi DN}{1000} = M/MIN$$

WHERE, CS = CUTTING SPEED

D = DIA OF THE JOB IN MM

N = SPINDLE SPEED IN R.P.M

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MATRIAL :- (1) X & YZ AXIS BED - STAINLESS STEEL

2) CNC MILLING BED - GIREAY CAST IRON

3) TAIL STOCK BED - CAST IRON

4) TAIL STOCK QUILL, TURRET, SPINDLE - TOOL STEEL, HARDEN STEEL

(GEOMETRIC CHARACTERISTIC SYMBOLS)

SYMBOL	CHARACTERISTIC	CATEGORY
—	STRAIGHTNESS	FORM
▱	FLATNESS	"
○	CIRCULATITY	"
⌭	CYLINDRICITY	"
⌒	PROFILE OF A LINE	PROFILE
⌓	PROFILE OF A SURFACE	"
∠	ANGULARITY	ORIENTATION
⊥	PERPENDICULARITY	"
//	PARALLELISM	"
⌖	POSITION	LOCATION
◎	CONCENTRICITY	"
⌯	SYMMETRY	"
↗	CIRCULAR RUNOUT	RUNOUT
⌰	TOTAL RUNOUT	"

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? HOMMING ?

HOMMING ?-

THIS PROCESS IS USED TO REFRESH THE M/C AXIS DURING THIS PROCESS THE ENTIRE AXIS OF THE M/C RETURN TO ITS ZERO POSITION ON INITHIAL POSITION. IT IS SPECIFIED BY THE MANUFACHER AND THE M/C VALUE IN THE POSITION IS DISPLAYED AS ZERO.

PROCESS ?-01

1) DISTURB THE BOTH (X, Z) OF AXIS OF THE M/C IN -VE DIRECTION IN HANDLE STEP MODE OR JOG MODE.

02) THEN GO TO 'ZRN' MODE IN MODE SELECTION.

03) REDUCE THE RAPID OVERRIDE TO ZERO PERCENT.

04) PRESS SMALL CYCLE START BUTTON.

05) THEN INCREASE THE RAPID OVERRIDE AND SEE THE POSITION WINDOWS.

PROCESS ?-02

1) DISTURB THE X & Z AXIS OF THE M/C IN THE -VE DIRECTION.

02) THEN GO TO 'ZRN' MODE IN MODE SELECTION.

03) REDUCE THE RAPID OVERRIDE TO ZERO.

04) PRESS X+ & Z+ IN THE JOG TABLE.

05) INCREASE THE RAPID OVERRIDE.

PROCESS ?-03

1) DISTURB THE BOTH (X,Y) AXIS IN -VE DIRECTION.

02) GO TO 'MDI' MODE IN MODE SELECTION.

03) WRITE THE PROGRAM - T0000; INSERT G100 X0 Z0; INSERT

04) REDUCE THE RAPID OVERRIDE TO ZERO.

05) GO TO POSITION WINDOW AND PRESS CYCLE START BUTTON.

06) INCREASE THE RAPID OVERRIDE.

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PROCESS ?- 04

1) DISTURB THE X & Z AXIS OF THE M/C IN -VE DIRECTION.

02) GO TO 'MDI' MODE IN MODE SELECTION.

03) WRITE THE PROGRAM - G28 U0 W0; INSERT

04) REDUCE THE RAPID OVERRIDE TO ZERO.

05) GO TO POSITION WINDOW.

06) PRESS THE CYCLE START BUTTON.

07) INCREASE THE RAPID OVERRIDE.

FUNCTION

FEED ?-

THE LINIER ADVANCEMENT OF THE TOOL AGAINST THE WORKPIECE IN ONE COMPLETE REVOLUTION IS KNOWN AS FEED IT IS UNIT IS MM/REV.

FORMULA ?- F = f x ZxN - RPM
- f → FEED PER TOOTH
- Z → NO. OF FLUTE

RAPID FEED ?-

IT IS FEED WHEN THE TOOL MOVES IN XZ PLANE WITHOUT TOUCHING THE WORKPIECE IN ONE MINUTE.

CUTTING FEED ?-

IT IS THE FEED WHEN THE TOOL START THE CUTTING IN XZ PLANE.

→ SELECTION OF MODE SELECTOR IN CNC M/C.

EDIT MODE ?-

IN THIS MODE WE CAN WRITE A PROGRAM, EDIT A PROGRAM, MODIFY A PROGRAM, AND DELETE A PROGRAM. IN THIS MODE THE PROGRAME IS SAVED AUTOMATICALLY.

SINGLE AUTO / SINGLE BLOCK ?-

IN THIS MODE THE PROGRAM IS EXECUTED BLOCK BY BLOCK AND TO EXECUTE EACH BLOCK CYCLE START BUTTON IS USED.

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AUTO CONTROL MODE :-

IN THIS MODE THE PROGRAM IS EXECUTED BLOCK BY BLOCK AND TO EXECUTE EACH BLOCK CYCLE START BUTTON IS USED.

(*) MDI :- (MANNUAL DATA INPUT)

IN THIS MODE WE CAN WRITE A PROGRAM OF MINIMUM 1 LINE MAXIMUM OF 6 LINE AND AFTER THE EXECUTION OF THE PROGRAM IT GETS DELETED AUTOMATIC THIS PROGRAM CAN'T BE SAVE.

(*) HANDLE STEP MODE :-

IN THIS MODE CAN DISTURB THE X & Z AXIS BOTH IN +VE AND -VE DIRECTION BY USING MPG.

(*) JOG MODE :- (ZERO RETURN MODE)

THIS MODE IS USED FOR HOMMING OF THE M/c.

(*) MPG :- (MANNUAL PULSE GENERATOR)

THIS CAN ALSO BE CALLED AS HANDLE WHEEL THIS IS USED TO MOVE THE REQUIRED AXIS (X, Z) MANNUALLY AS PER THE REQUIRMENT.

(*) OPTIONAL STOP :-

THIS BUTTON IS USED TO STOP OR PAUSE THE MACHINE OR A REQUIRED POSITION.

(*) BLOCK DELETE :-

BY USING THIS BUTTON WE CAN SKIP A BLOCK IN THE PROGRAM WITHOUT DELETING THE BLOCK BY USING A "/" IN THE START OF A BLOCK.

(*) DRY RUN :-

THIS IS USED TO SEE THE SIMULATION AND GRAPHICAL VIEW OF A PROGRAM

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(*) PROGRAM CHECK?

IN THIS MODE G1 CODE ARE ACTIVE AND M-CODE ARE LOCKED

(*) MACHINE LOCK?

IN THIS MODE M CODE ARE ACTIVE AND G1-CODE ARE LOCKED.

OFF SETTING

OFFSETTING?.

IT IS THE PROCESS BY WHICH THE REFERENCE POINT OF A WORKPIECE IS DEFIND TO THE M/C.

PROCESS?

DO THE HOMMING

SELECT THE TOOL STATION

TAKE THE TOOL TO THE SAFETY POSITION OF THE JOB.

REDUCE THE HANDLE STEP FEED UPTO 0.010MM

GO TO MDI MODE IN MODE SELECTION SWITCH.

PRESS [PROG] KEY

WRITE M04 S800; (EOB INSERT)

PRESS CYCLE START BUTTON.

GO TO HANDLE STEP MODE.

DO A LIGHT FACECUT

WITHOUT DISTURBING THE 'Z' AXIS TAKE THE TOOL TO THE SAFETY.

SECTION OF THE JOB ALONG 'X' AXIS.

-THEN STOP THE SPINDLE.

PRESS [OFFSET] IN HARD KEY.

PRESS [OFFSET] IN SOFT KEY

THEN PRESS GEOM (GEOMETRY) IN SOFTKEY

THEN SELECT OFFSET NUMBER AS PER TOOL STATION NUMBER

THEN SELECT 'Z' AXIS WRITE 'Z'0

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THEN PRESS [MEASURE] IN SOFT KEY.

THEN GO TO POSITION WINDOW.

THEN ROTATE THE SPINDLE.

THEN GIVE A CLEAN CUT ON THE PERIPHERY OF THE JOB.

THEN WITHOUT DISTURBING THE 'X' AXIS TAKE THE TOOL TO THE SAFETY POSITION OF THE JOB.

PRESS [OFFSET] IN PROGRAMMING KEY.

PRESS [OFFSET] IN SOFT KEY

PRESS [OFFSET / GEOM] IN SOFT KEY

THEN SELECT THE OFFSET NO. AS PER THE TOOL STATION NO SELECT 'x' AXIS.

THEN MEASURE THE DIAMETER OF THE JOB.

WRITE 'x' (EXACT DIAMETER OF THE JOB)

FOR E.G - X50.0

THEN PRESS [MEASURE] IN SOFT KEY

PRESS RESET DO THE HOMMING.

HOW TO CHECK OFFSETTING?

GO TO (MDI) MODE

PERSS (PROGRAM) KEY

WRITE

T0303; (AS PER YOUR TOOL STATION OFFSET NO.)

G00 Z2.0;

G00 X; (EXACT DIAMETER OF THE JOB+2MM VALUE)

FOR E.G - X52.0

THEN REDUCE THE RAPID FEED RATE TO ZERO.

GO TO POSETION WINDOW.

PRESS CYCLE START BUTTON)

INCREASE THE FEEDRATE OF RAPID UPTO [25%]

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TROUGH CUTTING FACING CYCLE

01. FACEING

PROGRAMMING ?-

SINTAX NO. → O0001 ← PROGRAM NO

T0000; ALL TOOL CANCEL

G100 X0;
G100 Z0;

T0404; (OFFSET NO OR TOOL NO)

G92 S800 M04; (SPINDLE MAX SPEED)
↑ SPEED ← CCW

G96 S80; (SPINDLE MIN SPEED)

G100 Z2.0;]
G100 X47.0;] (SAFETY HIGHT)

M07; (COLLENT ON)

G72 W0.2 R0.2;
↑ RETRACT

G72 P10 Q20 F0.2;

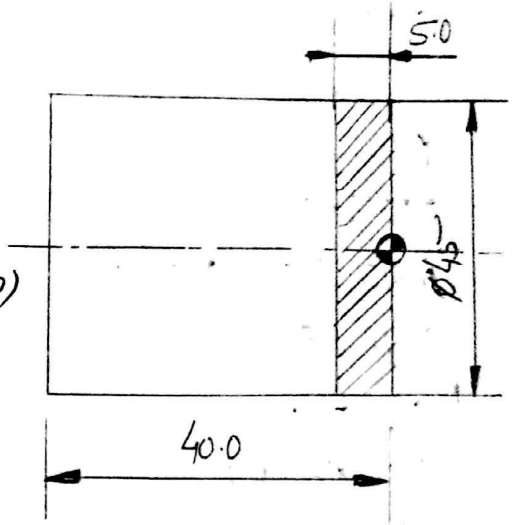
N10 G01 Z-5.0;
N20 G01 X-1.0;

G00 Z2.0;

G97 T0000 M09; (TOOL CANCEL & COLLENT CANCEL)

G100 X0;
G100 Z0;

M30; (END OF PROGRAM)



(ALL DIMENSION ARE IN MM)

PARAMETERS ?-

W - INCREMENTAL DEPTH ALONG Z-AXIS
R - RETRACTION
F - FEED RATE
G92 - MAX SPINDLE SPEED
G96 - MIN SPINDLE SPEED
P - START BLOCK NO
Q - END BLOCK NO

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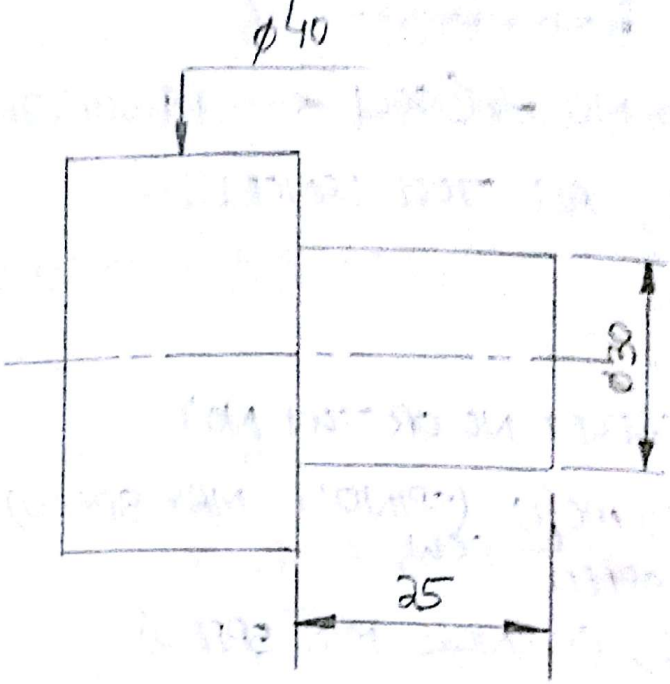
02) TURNING PROGRAM?



(ALL DIMENSION ARE IN MM)

```
O0002;
T0000;
G100 X0;
G100 Z0;
T0101;
G92 S1000 M04;
G96 S90;
G100 Z2.0;
G100 X42.0;
M07;
G71 U0.2 R0.1;
G71 P10 Q20 F0.2;
N10 G01 X30.0;
    G01 Z0;
    G01 Z-25.0;
N20 G01 X42.0;
    G01 Z2.0;
G97 T0000;
    M05;
    M09;
G100 X0;
G100 Z0;
    M30;
```

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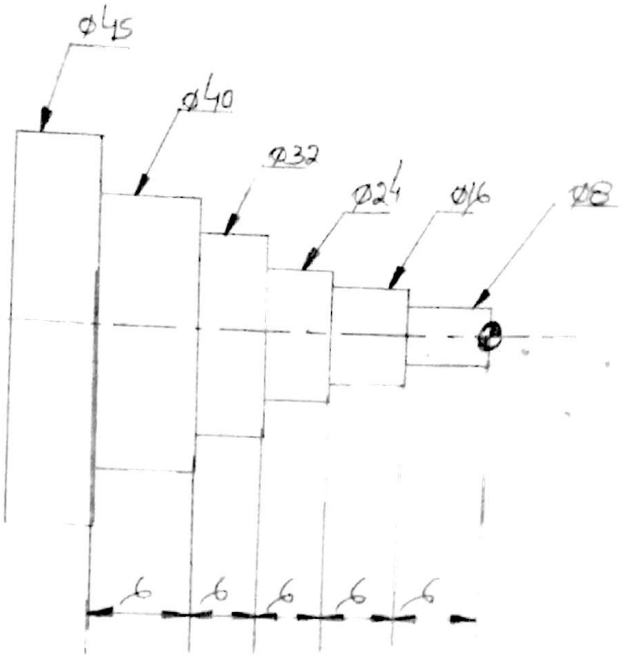
03) OPERATION:- STEP TURNING

```
O0001 ;
T0000;
G100 X0 ;
G100 Z0;
T0404;
G192 S800 M04;
G196 S80;
  G100 Z2.0;
  G100 X47.0;
  M07;
G71 U0.2 R0.2;
G71 P10 Q20 F0.2;
  N10 G01 X8.0;
  G01 Z -6.0;
  G01 X16.0;
  G01 Z -12.0;
  G01 X24.0;
  G01 Z -18.0 ;
  G01 X32.0;
  G01 Z-24.0;
G01 X40.0;
  G01 Z -30
N20 G01 X47.0;
    G100 Z2.0;
G97 T0000;
    M09;
   M05;
G100 X0;
G100 Z0;
   M30;
```



(ALL DIMENSION ARE IN MM)

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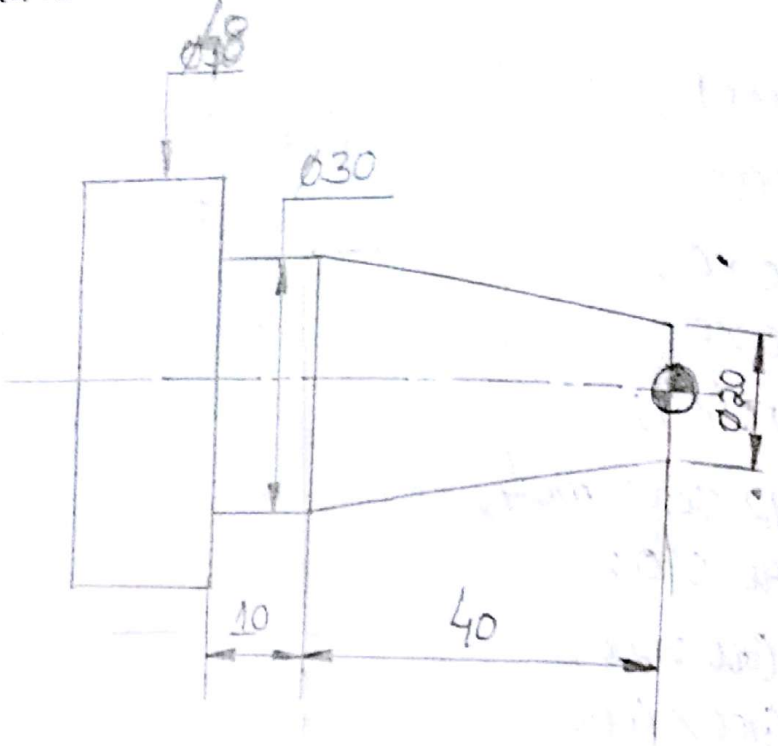
04) OPERATION :- TAPER TURNING



(ALL DIMENSION ARE IN MM)

```
O0001;
T0000;
G100 X0;
G00 Z0;
T0404;
G92 S800 M04;
G96 S80;
G00 Z2.0;
G00 X50.0;
M07;
G71 U0.2 R0.2;
G71 P10 Q20 F0.2;
N10 G01 X20.0;
G01 Z0.0;
G01 X30.0 Z-40.0;
G01 Z-50.0;
N20 G01 X50.0;
G01 Z2.0;
G97 T0000;
M09;
M05;
G100 X0;
G00 Z0;
M30;
```

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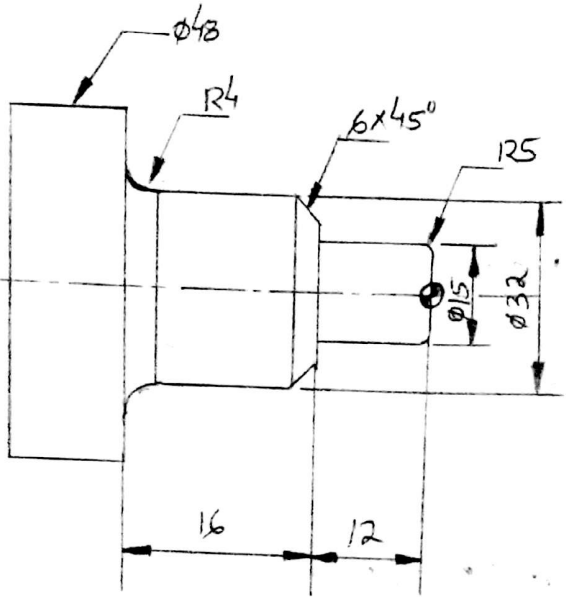
05) OPERATION:- FILLET & CHAMFER TURNING OPERATION

```
O0001;
T0000;
G100 X0;
G100 Z0;
T0404;
G192 S800 M04;
G196 S80;
G100 Z2.0;
G100 X50.0;
M07;
G71 U0.2 R0.2;
G71 P10 Q20 F0.2;
N10 G101 X5.0;
G101 Z0;
G103 X15.0 Z-5.0 R5.0;
G101 Z-12.0;
G101 X20.0;
G101 X 32.0 Z-18.0;
G101 Z-24.0;
G102 X40.0 Z-28.0 R4.0;
N20 G101 X50.0;
G101 Z2.0;
G197 T0000;
M09;
M05;
G100 X0;
G100 Z0;
M30;
```



(ALL DIMENSION ARE IN MM)

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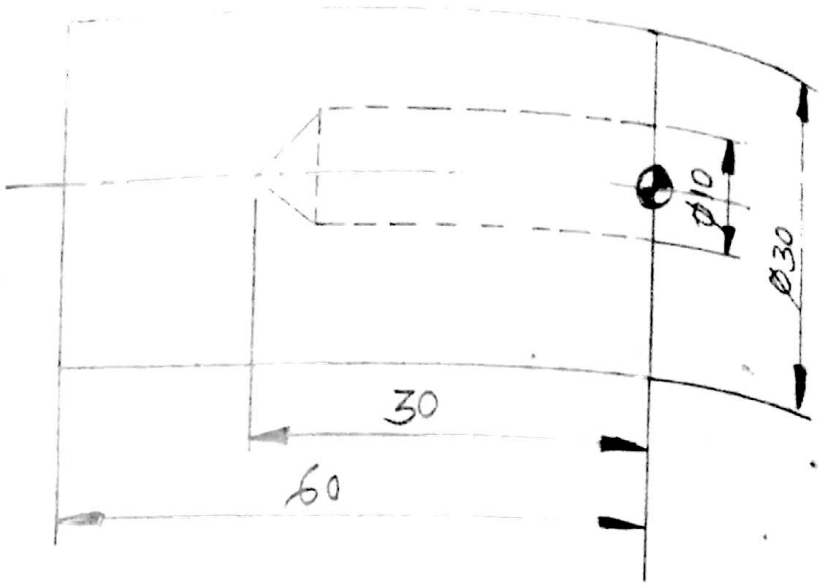
06) OPERATION :- DRILLING (G183)

```
O0001;
T0000;
G100 X0;
G100 Z0;
T0404;
G97 S700 M04;
G100 Z 2.0;
G100 X0.0;
M07;
G183 R0.2
G183 Z-30.0 Q200 F0.02
G100 Z 2.0;
G97 T0000;
M05;
M09;
G100 X0;
G100 Z0;
M30
```



(ALL DIMENSION ARE IN MM)

PARAMETERS :-

G183 → PECK DRILLING CYCLE

R → RETRACTION

Z → TOTAL DEPTH OF CUT

Q → INCRIMETAL DEPTH OF CUT

F → FEED

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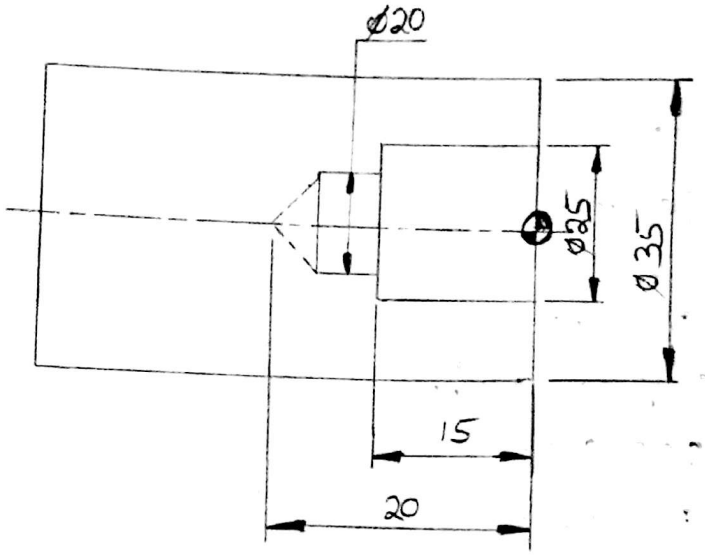
07) OPERATION :- PLAIN BORING & DRILLING OPERATION

```
O0004;
T0000;
G100 X0;
G100 Z0;
T0404;
G192 S500 M04;
G96 S80
G100 Z2.0;
G100 X18.0;
M07;
G71 U0.2 R0.2;
G71 P10 Q20 F0.2;
N10 G01 X25.0;
G01 Z-15.0;
N20 G01 X18.0;
G01 Z2.0;
G97 T0000;
M09;
M05;
G100 X0;
G100 Z0;
M30;
```



(ALL DIMENSION ARE IN MM)

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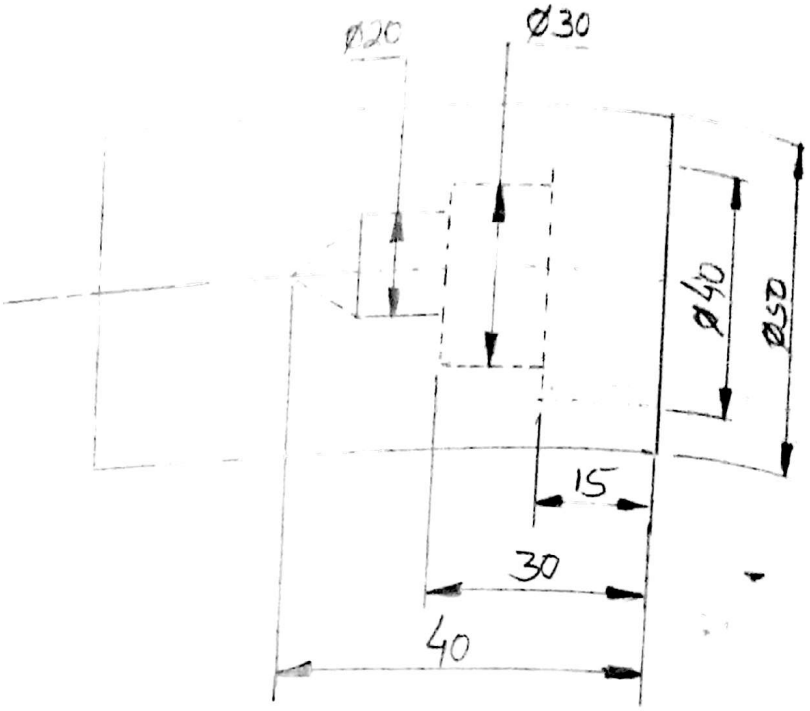
(08) OPERATION:- STEP BORING & DRILLING OPERATION



(ALL DIMENSIONS ARE IN MM)

```
O0005;
T0000;
G100X0;
G100Z0;
T0404;
G192S500M04;
G96S80;
G00Z2.0;
G00X18.0;
M07;
G71U0.2R0.2;
G71P10Q20F0.2;
N10G01X40.0;
G01Z-15.0;
G01X30.0;
G01Z-30.0;
N20G01X18.0;
G01Z2.0;
G97T0000;
M09;
M05;
G00Z0;
G00X0;
M30;
```

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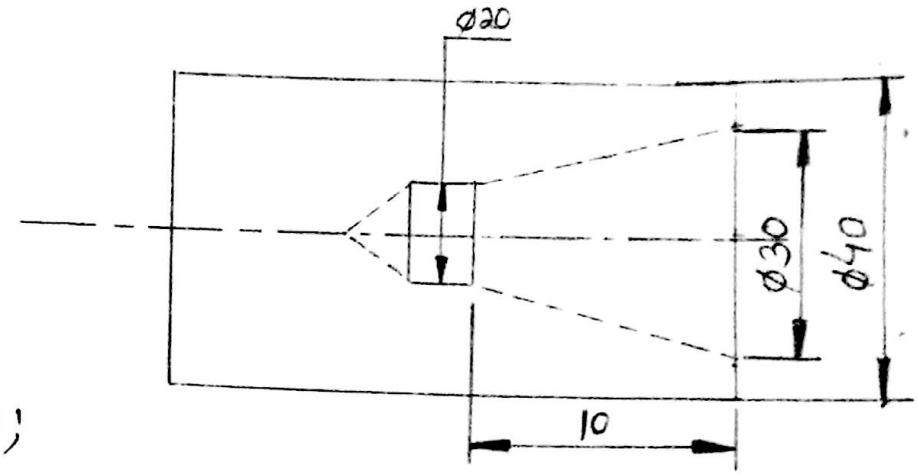
09) OPERATIONS :- TAPPER BORING & DRILLING

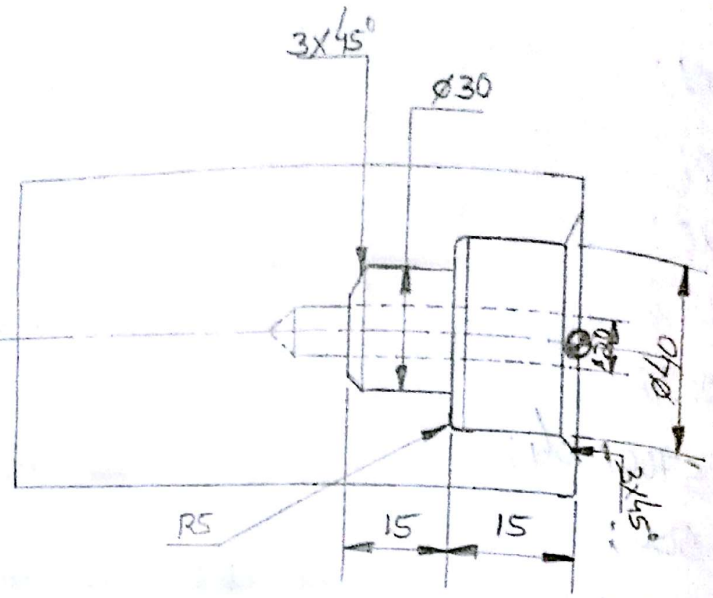
```
O0001;
T0000;
G100 X0;
G100 Z0;
T0202;
G192 S700 M04;
G96 S80;
G100 Z2.0;
G100 X18.0;
M07;
G71 U0.2 R0.2;
G71 P10 Q20 F0.2;
N10 G01 X30.0;
G01 Z0.0;
G01 X20.0 Z-10.0;
N20 G01 X18.0;
G01 Z2.0;
G97 T0000;
M09;
M05;
G100 X0;
G100 Z0;
M30;
```



(ALL DIMENSIONS ARE IN MM)

Scanned by CamScanner

10) OPERATIONS :- FILLET, CHAMFER BORING & DRILLI



(ALL DIMENSIONS ARE IN MM)

```
O0001;
T0000;
G100X0;
G100Z0;
 T0606;
G92 S700M04;
 G96 S80;
G100Z2.0;
G100X18.0;
 M07;
G71 U0.2 R0.2;
G71 P10Q20 F0.2;
 N10 G01X46.0;
   G01Z0.0;
 G01X40.0 Z-3.0;
 G01Z-10.0;
G03X30.0Z-15.0 R5.0;
  G01X30.0;
 G01Z-27.0;
 G01X30.0;
G01X24.0Z-30.0;
  N20 G01X18.0;
   G01Z2.0;
G97 T0000;
   M05;
  M09;
G100X0;
G100Z0;
   M30;
```

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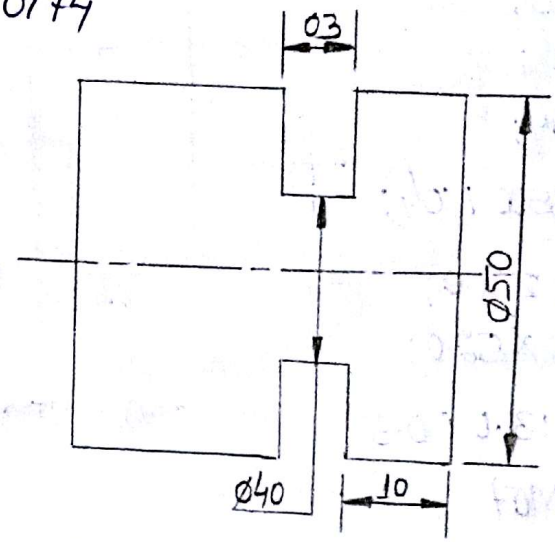
11) OPERATIONS :- EXTERNAL GROOVING (G175)

01) WHAT IS GROOVING ?

ANS → PRODUCING A NARROW CUT OR CAVITY ON A CYLINDRICAL SURFACE OR CONICAL SURFACE.

(*) AXIAL GROOVING - G175
(*) FACE GROOVING - G174



(ALL DIMENSIONS ARE IN MM)

```
O0001;
T0000;
G100X0;
G100Z0;
T0404;
G97 S400 M04;
G100Z2.0;
G100X52.0;
G101 Z-13.0 F0.5;
    M07;
G175 R0.2;
G175 X40.0 P200 F0.02;
   G101X52.0;
   G100 Z2.0 F0.5;
G97 T0000;
    M09;
    M05;
G100X0;
G100Z0;
    M30;
```

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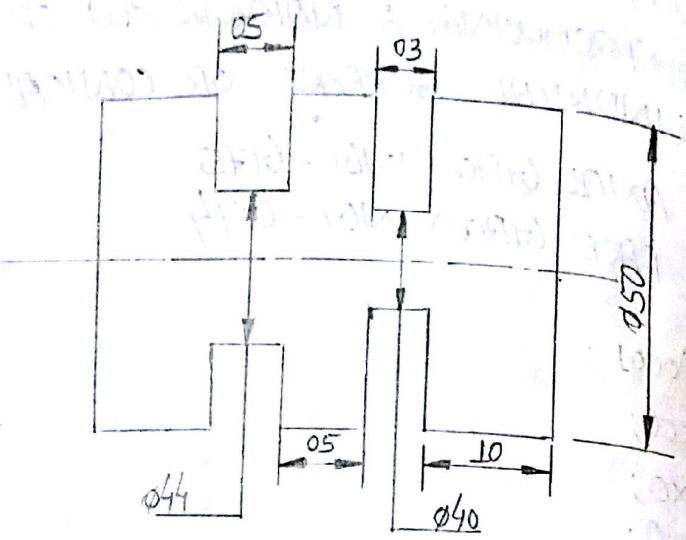
(2) OPERATIONS:- EXTERNAL GROOVING



(ALL DIMENSIONS ARE IN MM)

```
O0001;
T0000;
G100 X0;
G100 Z0;
T0404;
G197 S500 M04;
   G100 Z2.0;
   G100 X52.0;
G101 Z-13.0 F0.5;
     M07
G175 R0.2;
G175 X40.0 P200 F0.02;
   G101 X52.0;
G101 Z-21.0 F0.5;
  G175 R0.2;
G175 X44.0 P200 Q2500 Z-23.0 F0.02;
   G101 X52.0;
  G101 Z2.0 F0.5;
    G197 T0000;
    M09;
    M05;
G100 X0;
G100 Z0;
   M30;
```

[Q2500 = INCREMENTAL DEPTH OF CUT IN MICRON. ALONG Z DIRECTION]

(*) GROOVING TOOL HOLDER SPECEFICATION = TTER 2525-2T17

(*) GROOVING TOOL INSERT SPECEFICATION = TDCM

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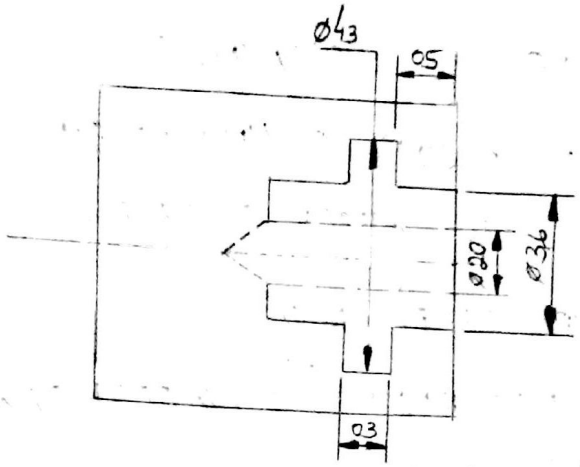
13) OPERATIONS :- DRILLING, BORING & INTERNAL GROOVING

```
O0032;
T0000;
G100 X0;
G100 Z0;
T0404;
G97 S400 M04;
G100 Z2.0;
G100 X34.0;
M07;
G01 Z-8.0 F0.5;
G75 R0.1;
G75 X43.0 P200 F0.02;
G01 X34.0 F0.5;
G01 Z2.0;
G97 T0000;
M09;
M05;
G100 X0;
G100 Z0;
M30;
```



(ALL DIMENSIONS ARE IN MM)

(*) INTERNAL GROOVING INSERT SPECIFICATION = ICMF130304

(*) TOOL HOLDER SPAIFICATION = A20R - GHFR1303

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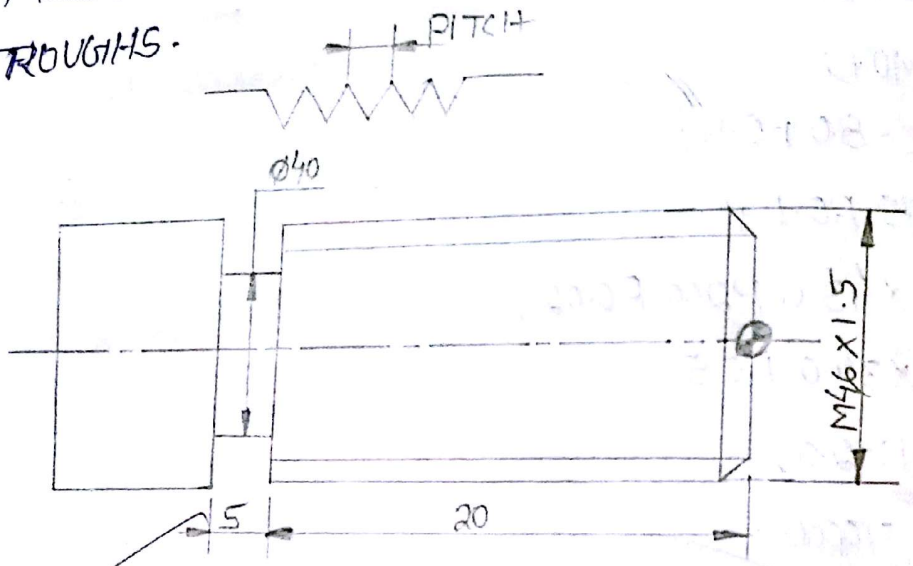
14) OPERATIONS ?- TURNING, GROOVING & EXTERNAL THREADING (G76)

01) WHAT IS THREADING ?

ANS→ PRODUCING A HELICAL GROOVE ON A CYLINDRICAL SURFACE OR CONICAL SURFACE.

02) WHAT IS PITCH ?

ANS→ DISTANCE BETWEEN TWO CONSCQUTIVE CRESTS & TROUGHS.



(ALL DIMENSIONS ARE IN MM)

```
O0001;
T0000;
G100 X0;
G100 Z0;
T0404;
G97 S400 M04;
G100 Z 2.0;
G100 X 48.0;
M07;
G76 P040060 Q20 R0.02
G76 X44.05 Z20.0 P975 Q20 F1.5
```

NO OF FINISHING PASSES

END PULLOUT ANGLE

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```
G100 X 48.0;
G100 Z 2.0;
G197 T0000;
    M09;
    M05;
G100 X 0;
G100 Z 0;
    M30;
```

PARAMETERS :-

04 → NO OF FINISHING PASSES

00 → END PULLOUT ANGLE

60 → THREAD ANGLE

Q → INITIAL DEPTH OF CUT

R → FINISHING ALLOWANCE

X → MINOR DIAMETER

Z → TOTAL LENGTH

P → THREAD HEIGHT

Q → INCREMENTAL DEPTH OF CUT → 20

F → PITCH

(*) MINORDIA = MIJORDIA − (2 × THREAD HEIGHT)

= 46 − (2 × 0.975) = 46 − 1.95

= 44.05

(*) THREAD HEIGHT = 0.65 × PITCH

= 0.65 × 1.5

= 0.975

(*) P = 0.975 × 1000

= 975

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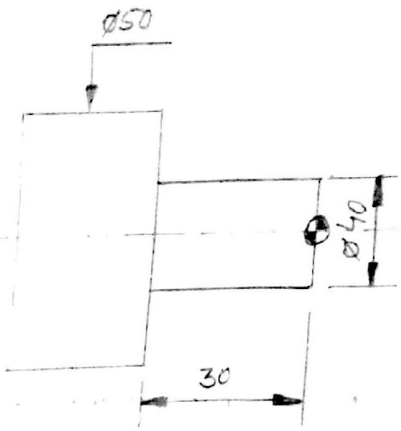
15) OPERATIONS: FINISHING CYCLE (G70)



(ALL DIMENSIONS ARE IN MM)

```
O0001;
T0000;
G100 X0;
G100 Z0;
T0404;
G96 S700 M04;
  G92 S80;
G00 Z2.0;
G00 X52.0;
  M07;
G71 U0.2 R0.2;
G71 P10 Q20 F0.2 U0.03;
N10 G01 X40.0;
  G01 Z-30.0;
N20 G00 X52.0;
  G00 Z2.0;
G97 T0000;
  M09;
  M05;
G00 X0;
G00 Z0;
  M01;
N1 T0505
G97 S1000 M04;
  G00 Z2.0;
  G00 X52.0;
  M07;
G70 P10 Q20 F0.1;
  G00 Z2.0
G97 T0000;
```

← FINISHING ALLOWENCE

```
M05;
M09;
G00 X0;
G00 Z0;
M30;
```

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ISO METRIC SCREW THREAD

SIZE(MM)	DRILL SIZE (MM)	PITCH SIZE (MM)
M2	1.6	0.4
M3	2.5	0.5
M4	3.3	0.7
M5	4.2	0.8
M6	5.0	1.0
M8	6.8	1.25
M10	8.5	1.5
M12	10.25	1.75
M14	12.0	2.0
M16	14.0	2.0
M18	15.5	2.5
M20	17.5	2.5
M24	21.0	3.0

(*) JAIN SETTING FOR CNC TURNING :-

$$= \frac{36 - \text{DIA OF JOB}}{3}$$

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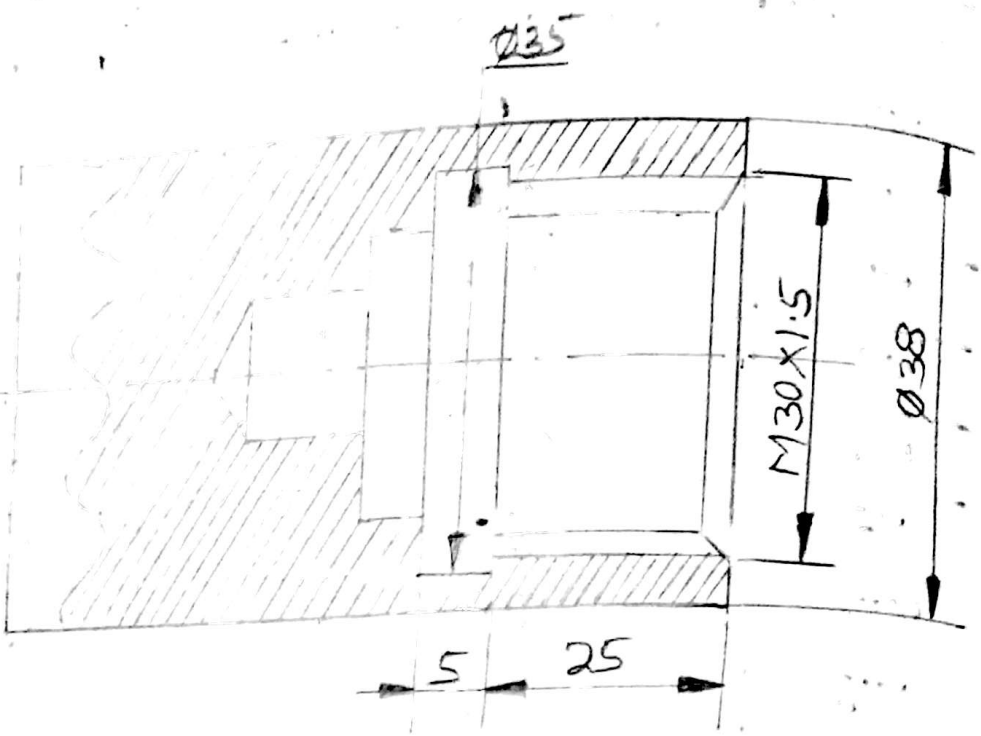
16) OPERATIONS ?- DRILLING, BORING, INTERNAL THREADING (G76)



(ALL DIMENSIONS ARE IN MM)

```
O0002;
T0000;
G100 X0;
G100 Z0;
T0404;
G97 S400 M04;
  G100 Z2.0;
  G100 X26.05;
  M07;
G76 P040060 Q20 R0.02
G76 X30.0 Z-25 P975 Q20 F1.5
  G100 X26.05;
  G100 Z2.0;
  G97 T0000;
  M09;
  M05;
G100 Z0;
G100 X0;
  M30;
```

V. Good

Ganga 30/1/17

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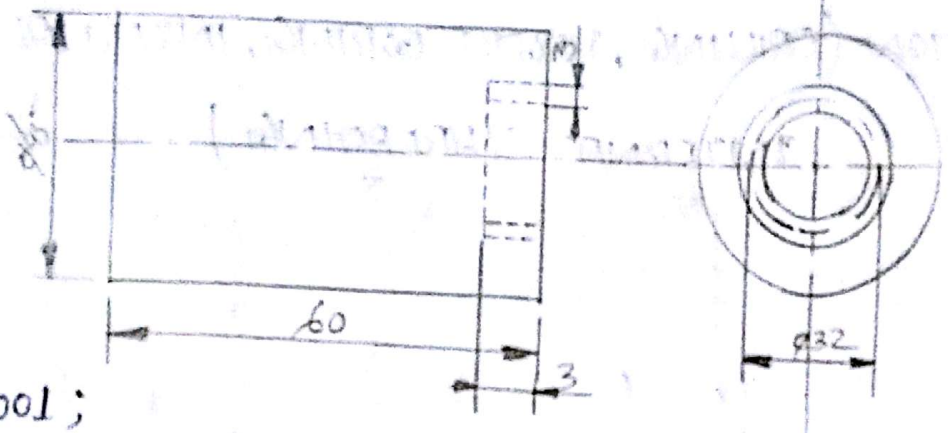
(17) OPERATIONS :- FACE GROOVING (G74)




```
O0001 ;
T0000 ;        (ALL DIMENIONS ARE IN MM)
G100 X0 ;
G100 Z0 ;
T0404 ;
G97 S450 M04 ;
G100 Z2.0 ;
G100 X48.0 ;
G101 X29.0 F0.5 ;
M07 ;
G74 R0.2 ;
G74 Z-3.0 Q200 F0.02 ;
G101 Z2.0 ;
G101 X48.0 ;
G97 T0000 ;
M09 ;
M05 ;
G100 X0 ;
G100 Z0 ;
M30 ;
```

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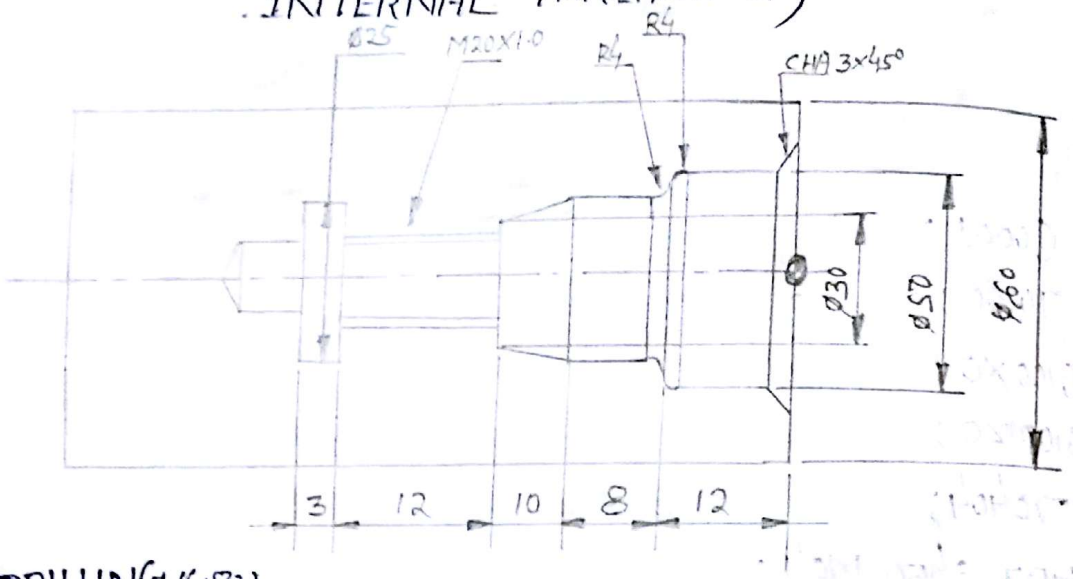
(18) OPERATIONS :- COMBINATION OF ALL INTERNAL OPERATION (DRILLING, PROFILE BORING, INTERNAL GROOVING, INTERNAL THREADING)



DRILLING (G83)

```
O0001;
T0000;
G100 X0;
G100 Z0;
T0404;
G97 S400 M04;
  G100 Z2.0;
  G100 X0.0;
   M07;
G83 R0.02;
G83 Z-50.0 Q200 F0.02;
    G100 Z2.0;
 G97 T0000;
    M09;
    M05;
G100 X0;
G100 Z0;
```

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PROFILE BORING (G71)

```
M01
N1 T0000;
G100 X0;
G100 Z0;
T0505;
G192 S700 M04;
 G96 S80;
G100 Z2.0;
G100 X14.0;
   M07;
G71 U0.62 R0.2
G71 P10 Q20 F0.2;
N10 G101 X56.0;
G101X50.0 Z-3.0;
 G101 Z-8.0;
G103 X42.0 Z-12.0 R4.0;
G102 X34.0 Z-16.0 R4.0;
    G101 Z-20.0;
  G101 X34.0;
G101 X 30.0 Z-30.0;
 G101 X 20.0;
 G101 Z-42.0;
N20 G101 X14.0;
   G101 Z2.0;
 G197 T0000;
   M09;
   M05;
G100 X0;
G100 Z0;
```

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GROOVING (G75)

```
M01
N12 T0000 ;
G100 X0 ;
G100 Z0 ;
T0707 ;
G97 S400 M04 ;
G100 Z2.0 ;
G100 X14.0 ;
G101 Z-45.0 F0.5 ;
G75 R0.1 ;
G75 X25.0 P200 F0.02 ;
G101 Z2.0 ;
G101 X14.0 F0.5 ;
G97 T0000 ;
M09 ;
M05 ;
G100 X0 ;
G100 Z0 ;
```

INTERNAL THREADING (G76)

```
M01 ;
N13 T0000 ;
G100 X0 ;
G100 Z0 ;
T0606 ;
G97 S400 M04 ;
G100 Z2.0 ;
G100 X18.7 ;
M07
```

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```
G176 P0400,60 Q20 R0.02;
G176 X20.0 Z-42.0 P650 Q20 F1.0;
  G100 X18.7;
  G100 Z2.0;
G197 T0000;
  M09;
  M05;
G100 X0;
G100 Z0;
  M30;
```

Scanned by CamScanner