Experiment No. 1 CNC -Lathe

List of G -codes

G00 Rapid Traverse

- G0l Linearinterpolation
- G02 Circular interpolation-clockwise
- G03 Circular interpolation counterclockwise
- G21 Dimensions are immm
- G28 Home position
- G40 CompensationCancelG50–SpindlespeedclampG70–Finishingcycle

G71 — Multiple turning cycle G75 — Multiple grooving cycle G76 — Multiple threading cycle G90 Box turning cycle

G98–Feedinmm/min

List of M-codes

M03 Spindle ON in clockwisedirection

Program stop andrewind

M05 SpindlestopM06–ToolchangeM10–ChuckopenM11 M30

Chuckclose

- M38 Door open
- M39 Doorclose

BOX TURNINGCYCLE

AIM- To write the manual part program to the given dimensions and execute in CNC Lathe. (G90)

Material required:

MaterialAluminiumSize. Diameter 25mm and Length 50mm

Program:

[BILLET X25 Z50; G21 G98 G40; G28 U0 W0; G50 52000; M06 T01; M03 S1200; G00 X26 Z1; G90 X24 Z—30 F45; X23; X22; X21; X20; G00 X21 Z1; G90 X19 Z—10 F45; X18; X17; X16; X15; X14; X13; X12; X11; X10; M05; G28 U0 W0; M30;

Result:

MULTIPLE TURNING CYCLE

AIM: To write the manual part program to the given dimensions and execute in CNC Lathe. (G71).

Material required:

Material: AluminiumSize. Diameter 25mm and Length 50mm

Program:

[BILLET X25 Z50; G21 G98 G40; G28 U0 W0; G50 52000; M06 T01; M05 S1200; G00 X26 Z1; 4G71 U0.5 R1; G71 P100 Q200 U0.1 W0.1 F45; N100 G01 X0; Z0; G03 X10 Z-5 R5; G01 X10 Z-15; G02 X20 Z-25 R10; G01 X20 Z-30; N200 G0I X25 Z-40; M03 1500; G70 P100 Q200 F25;M05; G28 U0 W0; M30;

Note:
G71 U0.5 R1
Where,
U0.5 depth of cut in mm
R1 - relief inmm
G71 P100 Q200 U0.1 W0.1 F45;
Where,
P100-firstlinenumber
Q200 — last line number
U0.1 finishing allowance in x-axis
W0.1 finishing allowance inz-axis
G70 — Finishing cycle between first and last line number.
Conditions:
• In the first line number only G01 and X
codes must only bewritten.
- Z code for the first coordinate must be written
in the nextline.
• G71 will not work for left downwardtaper.
• Between G71 cycle only G01, G02and
G03 must be written.

Result:

Thus the manual part program was written to the given dimensions and executed in CNC

Lathe.

TAPER TURNING CYCLE

Aim: To write the manual part program to the given dimensions and execute in CNC Lathe. (G 90)

Material required:

MaterialAluminiumSize: Diameter 25mm and Length 50mm

Program:

[BILLET X25 Z50; G21 G98 G40; G28 U0 W0; G50 52000; M06 T01; M03 S1200; G00 X2d Z1; G90 X24 Z-39 F45; X23; G00 X24 Z1; G90 X22 Z-34 F45; X21; X20; G00 X21 Z1; G90 X19 Z-10 F45; X18; X17; X16; X15; X14; X13; X12; XII; X10; G00 XII Z1; G90 X10 Z-10 R-0.5 F40; X10 R-1; X10 R—1.5; X10R-2;X10R-2.5;X10R-3;X10R-3.5;X10R-4;X10R-4.5;X10R-5;G00 X2lZ—10; G00X20Z-15; G90 X19 Z-22 R0.5 F40; X18 R1; X17 R1.5; X16 R2; X15 R2.5; G00 X21 Z-21; G90X20Z—29R—0.5F40;X20R—1; X20 R-1.5; X20 R-2; X20 R-2.5; G00 X25Z1; M05; G28 U0 W0; M30;

Result:

Experiment N0.-5

MULTIPLE GROOVING CYCLE

Aim:- To write the manual part program to the given dimensions and execute in CNC Lathe. (G75).

Material required:

MaterialAluminiumSize. Diameter 40mm and Length 55mm

Program:

[BILLET X40 Z55; G21 G98 G40; G28 U0 W0; G50 S2000; M0d T01; M03 S1200; G00 X41 Z1; G71 U0.5 R1; G71 P100 Q200 U0.1 W0.1 F45; N100 G01 X16; Z0; G01 X30 Z-2; G01 X30 Z-35; Note G75 R1 N200 G01 X40 Z-45; G28 U0 W0; M06 T02; M03 Where, RI relief inmm 5700; G00 X31 Z-17; G75 R1; G75X24Z-30P1000Q1750 G75 X24 Z-30 P1000 Q1750 F10; F10; G01X33; Where, M05: X24 minor dia. of groove G28 U0 W0; M30; Z-30-finalpointinlength P1000- increment inX-axisin microns Q1750 - increment in Z- axis in microns

Result:

MULTIPLE THREADINGCYCLE

Aim: To write the manual part program to the given dimensions and execute in CNC Lathe. (G76).

Material required:

Material: AluminiumSize. Diameter 40mm and Length 55mm

Program:

[BILLET X40 Z55; G21 G98 G40; G28 U0 W0; G50 S2000; M06 T01; M03 S1200; G00 X41 Z1; G71 U0.5 R1; G71 P100 Q200 U0.1 WO.1 F45; N100 G01 X16; Z0: G01 X30 Z-2; G01 X30Z-35; N200 G01 X40 Z-45; G28 U0 W0. M0d T02; M03 5700; G00 X31 Z-17; G75 RI; G75 X24 Z-30 P1000 Q1750 Fl0; G01 X33; G00 Z1; G28 U0 W0; M06 T03; M03 S350; G00 X31 Z1; G76 P031560 Q50 R0.1; G76 X27.546 Z-16 P1227 Q60 F2; M05; G28 U0 W0; M30;

Nett: G76 P031560 Q50 R0,1 Where, P031560 -03 no. of finishing passes 15 — pull outangle 60-angleofthread Q50- depth ofcut in microns R0.1 — finishing allowance G76 X27.546 Z-16 P1227 Q60 F2; Where, X27.546 core diameter for M30x2 fine series Z-16 — length ofthread

P1227 depth of thread in microns

Q60 first depth ofcut F2 pitch of thethread

Result:

CNC —Milling

List of G —codes

- G00 Rapid Traverse
- ${\rm G0l-Linear interpolation}$
- G02 Circular interpolation—clockwise
- ${\rm G03-Circular\ interpolation-counterclockwise}$
- G21 Dimensions are immm
- G28 Homeposition
- G40– CompensationCancelG50– SpindlespeedclampG83 Peckdrillingcycle
- G90 Absolute coordinatesystemG91 Incremental coordinatesystemG94 Feed in mm/min
- G170,G171 CircularPocketing
- G172,G173 RectangularPocketing

List of M-codes

- $\overline{M03}$ Spindle ON in clockwise direction
- M05 SpindlestopM06-ToolchangeM10-ChuckopenM11 Chuckclose
- M30 Program stop andrewind
- M38 Door open
- M39 Doorclose
- M70 Mirroring ON in X-axis M71 Mirroring ON in Y-axis M80 Mirroring OFF in X-axis
- M81 Mirroring OFFinY-axisM98 Subprogram callstatementM99–Subprogram terminate

EXPERIMENT NO. - 7

LINEAR AND CIRCULAR INTERPOLATION

Aim: To write the manual part program to the given dimensions and execute in CNC Milling.

Material required:

Material	: Acrylicsheet
Size	: Length 100mm, Width 100mm and Thickness5mm

Program:

[BILLET X100 Y100 Z5; [EDGEMOVE X0 Y0; [TOOLDEF T1 D5; G21 G94 G40; G91 G28 Z0; G28 X0 Y0; G28 M06 T01; M03 S1500; G90 G00 X0 Y0 Z5; G00 X25 Y10; G01 Z-2 F40; G03 X10 Y25 R15; G01 X10 Y75; G02 X25 Y90 R15; G01 X75 Y90; G03 X90 Y75 R15; G01 X90 Y25; G02 X75 Y10 R15; G01 X25 Y10; G01 Z5; M05; G91 G28 X0 Y0 Z0; M30;

Result:

CIRCULAR POCKETTING

Aim: To write the manual part program to the given dimensions and execute in CNC Milling.

Material required:

Material: AcrylicsheetSize: Length 100mm, Width 100mm and Thickness5mm

Program:

[BILLET X100 Y100 ZS; [EDGEMOVE X—50 Y—50;[TOOLDEF T1DS; G21 G94 G40; G91 G28 Z0; G28 X0 Y0; M06 T01; M03 S1500; G90 G00 X0 Y0 Z5; G01 Z0 F300; G170R0P0Q1X0Y0Z—310.5J0.1K— 25; G171 P75 S2500 R75 F250 B3500 J200; G00Z5; M05; G91 G28 X0 Y0 Z0; M30;	Note: G170 R0 PO Q1 X0 Y0 Z-3 10.5 JO.1 K-25; Where, R0–referencepoint P0– roughing;PI finishing Q1–depthofeachcut X,Y — center coordinate of circle measured from datum point Z-3 — total depth 10.5 finishing allowance at side J0.5 — finishing allowance atbottom K-25– radiusofpocket
	G171 P75 S2500 R75 F250 B3500 J200; Where, P75 percentage of cut S2500 — speed R75 — feedinZ-axis F250 – feedinXandYaxis B3500 – finishingspeed J200 finishingfeed

Result:

RECTANGULAR POCKETTING

Aim: To write the manual part program to the given dimensions and execute in CNC Milling.

Material required:

Material : Acrylicshee	et		
Size : Length 100	mm, Width 100mm ar	nd Thickness5mm	
Program: [BILLET X100 Y100 Z5; [E X—50 Y—50; [TOOLDEF]] G21 G94 G40; G91 G28 Z0; M0d T01; M03 S1500; G90 G00 X0 Y0 ZS; G01 Z0 G172 1-60 1-50 K0 P0 Q1 R Z—3; G173 10.5 K0.1 P75 TI 5250 M05; G91 G28 X0 Y0 Z0; M30;	DGEMOVE II D5; G28 X0 Y0; D F300; O X-30 Y-25 0 R75 F250 B3000 J2 Note: G173 IO.5 Where, I&K-finish percentage T-tool S- speed R-feedinZ- F-feedinXa - safeheigh	Note: G172 I-60 J-50 K0 PO Q1 RO X-30 Y-25 Z-3; Where, ↓ lengthoftherectangleinX-axis I - width of the rectangle inY-axisK coradius P0- roughing:P1 finishing Q- depthofeachcut R - reference point X,Y— left downward coordinate 200 Z5; G00 Z25; KO.1 P75 T1 S2500 R75 F250 B3000 J200 Z5; ningallowance atside&base P — of cut axis axis mdYaxisB&J finishingspeed&feedZ ht	; prnei

Result:

PECK DRILLING

Aim: To write the manual part program to the given dimensions and execute in CNC Milling.

Material required:

Material: AcrylicsheetSize: Length 100mm, Width 100mm and Thickness5mm

Program:

[BILLET X100 Y100 ZS; [EDGEMOVE X0 Y0; [TOOLDEF TI DS; G21 G94 G40; G91 G28 Z0; G28 X0 Y0; M06 T01 ; M03 S1500; G90 G00 X25 Y25 Z5; G83 G99 X25 Y25 Z-3 QI R2 F200; X75 Y25; X50 Y50; X25 Y75; G98 X75 Y75; G80; G00 Z25; M05; G91 G28 X0 Y0 Z0; M30;

Note: G83 G99 X25 Y25 Z-3 Q1 R2 F200; Where, G83 peck drillingcycle G99 return to R in canned cycle X&Y— firstdrillcoordinate Z-3 total depth of cut Q1 depth of eachcut R2 starting point of drilling cycle in Z- axis F — feed inZ-axis G98 return to initial point in canned cycle G80 — canned cyclecancel

Result:

Experiment:-11

MIRRORING

Aim: To write the manual part program to the given dimensions and execute in CNC Milling.

Material required:

Material: AcrylicsheetSize: Length 100mm, Width 100mm and Thickness5mm

Program:

[BILLET X100 Y100 ZS; [EDGEMOVE X-50 Y-50; [TOOLDEF TI DS; G21 G94 G40; G91 G28 Z0; G28 X0 Y0; G50 S3000; M06 T1; M03 52000; G01 Z0 F300; G90 G00 X10 Y10 Z5; M98 P0011000; M70; M98 P0011000; M80; M71; M98 P0011000; M70; M98 P0011000; M70; M98 P0011000; M80; M05; G90 G28 X0 Y0 Z0; M30; Note M98 P0011000; Where, M98 — sub program call P0011000 — P001 means Number of times to repeat 1000 means Sub program file name M70 — Mirroring ON in X-axis M71 - Mirroring ON in Y-axis M80 — Mirroring OFF in X-axis M81 — Mirroring OFF in Y-axis M99 — Sub program terminate

G90 X10 Y10 Z5; G01 Z-3; X40 Y10; X25 Y40; X10Y10; G00 X0 Y0 Z5; Maa

Result: