

MOHD SHARIZAN BIN MOHD SHARIF
Jabatan Kejuruteraan Mekanikal

CNC TURNING

sharizan/CNC Turning TNA300

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CNC TURNING

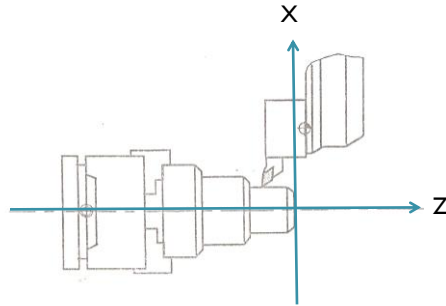
TRAUB TNA 300



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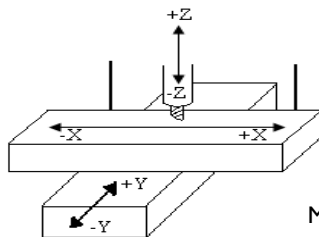
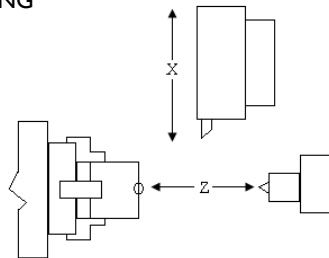
AXIS



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TURNING

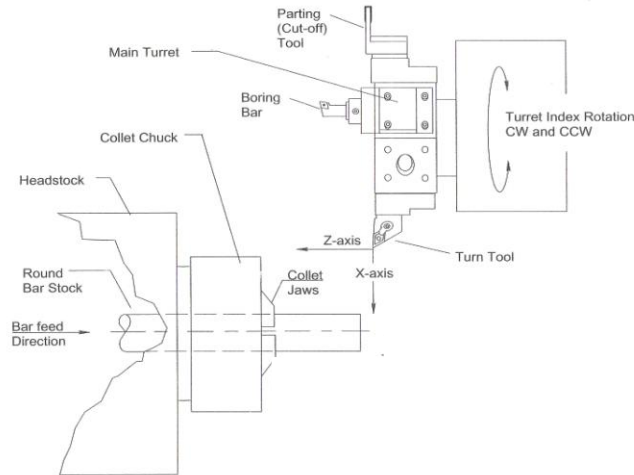


MILLING

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Coordinate system for CNC Turning machines



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MACHINE COMMAND CODES

- **G code** - Set preparatory machine functions such as rapid traverse mode, feed mode and active tool length offsets.
- **M code** - Perform a miscellaneous machine function such as automatic tool changes, coolant control and spindle operations.

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G Instructions

- G00 Straight line at the rapid traverse
- G01 Straight line at the feed rate
- G02 Circular arc, clockwise (right)
- G03 Circular arc, counter clockwise (left)
- G26 Approach to tool changing (Home)
- G40 Tools nose off
- G46 Tools nose on
- G59 Zero point shift
- G71 Longitude roughing cycle
- G92 Speed limitation
- G96 Constant cutting speed

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M Instructions

- M00 Programmed stop
- M03 Spindle right (clockwise)
- M04 Spindle left (counterclockwise)
- M05 Spindle stop
- M08 Coolant on
- M09 Coolant off

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Program Block

G01 X30 Z-20 F0.2



G-Instruction

Auxiliary conditions

Step in programming

- Start – work piece zero point, cutting speed, tool, spindle rotation, speed limit
 - Facing
 - Roughing
 - Cutting
 - Close - stop spindle, stop coolant, program stop
- } process



Start

example

%

O 4546

G59 X 0 Z ____

G96 V ____ T ____ M ____

G92 S ____ M08

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Start

example

%

O 4546

G59 X 0 Z ____

G96 V ____ T ____ M ____

G92 S ____ M08

Symbol

Program number

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Start

example

%

O 4546

G59 X 0 Z ____

Zero point shift

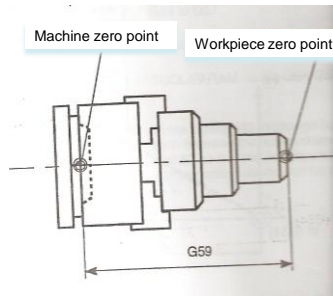
G96 V ____ T ____ M ____

G92 S ____ M08

G59 – zero point shift

G59 X 0 Z ____

CALCULATE Z



spindle length = 150mm
 + Work piece length = ____
 + allowance = 10mm

TOTAL = ____

Start

example

%

O 4546

G59 X 0 Z

G96 V ___ T ___ M ___

G92 S ___ M08

Constant cutting speed

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Start

example

%

O 4546

G59 X 0 Z

G96 V ___ T ___ M ___

G92 S ___ M08

Tools

Spindle rotation

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G96 V ___ T ___ M ___

- V ___ } VELOCITY –
by calculation or table
- T ___ } No of Tools
- M ___ } Spindle rotation (CW / CCW)



Start

example

```

%
O 4546
G59 X 0 Z ___
G96 V ___ T ___ M ___
G92 S ___ M08
    
```

Speed limit

Coolant on

G92 S_____M_____

- S2000 } SPEED LIMIT – calculation or table

- M08 } Coolant on

CLOSE

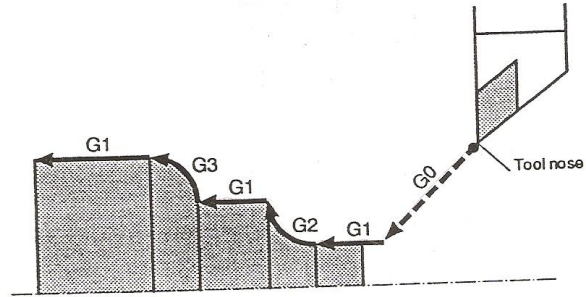
example



G26 } Approach to tools changing (home)
 M05 M09 } Spindle stop/Coolant off
 M00 } Program stop
 %

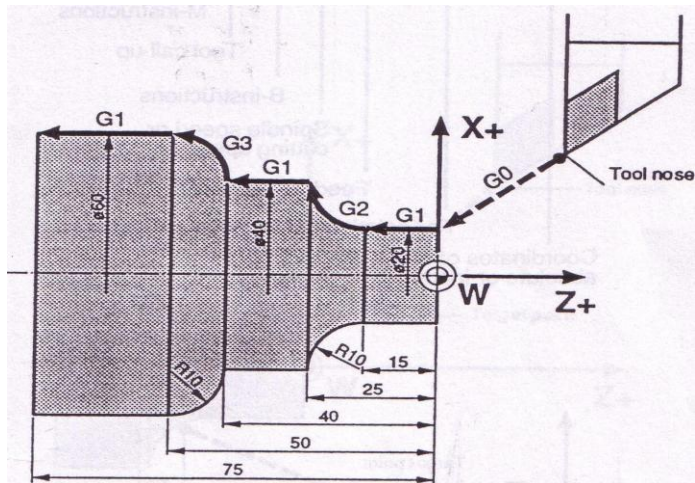
PROGRAMMING TECHNIQUE

Using G code



Dr. VANT

PROGRAMMING TECHNIQUE



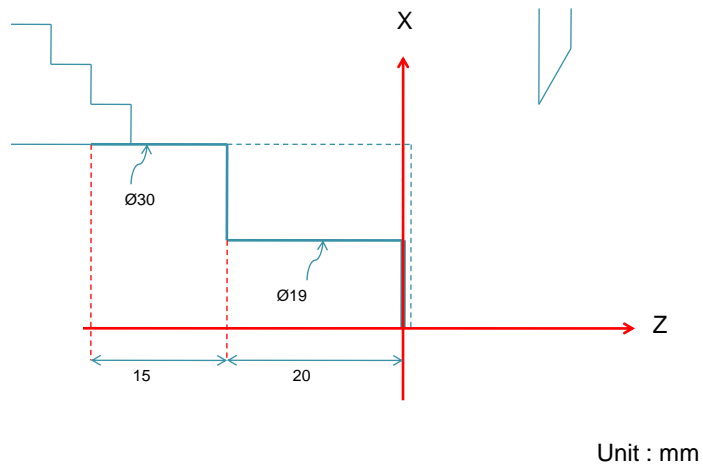
PROGRAMMING TECHNIQUE

```

G0 X20 Z2
G1 X20 Z-15 F0.2 ← F - federate
G2 X40 Z-25 R10
G1 X40 Z-40
G3 X60 Z-50 R10
G1 X60 Z-75
    
```

X = Diameter of work piece

EXAMPLE I



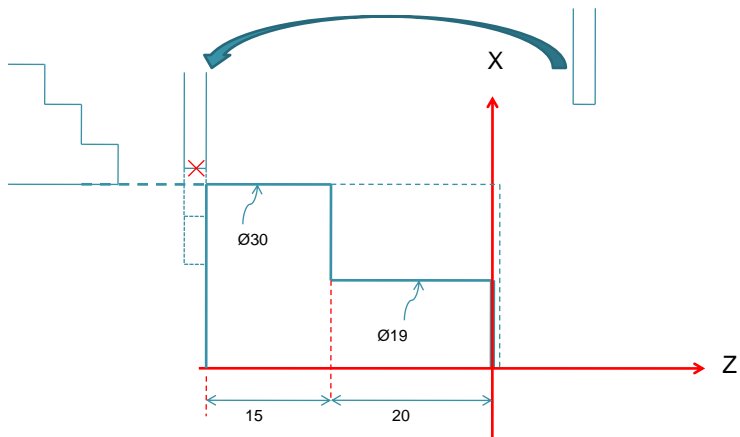
EXAMPLE 1- solution

%	
O 652	
G59 X0 Z180	START
G96 V200 T0202 M03	
G92 S2000 M08	
G00 X32 Z0	FACING
G01 X-1 Z0 F0.2	
G00 X26 Z2	
G01 X26 Z-20	
G00 X27 Z-20	
G00 X27 Z2	
G00 X22 Z2	ROUGHING
G01 X22 Z-20	
G00 X23 Z-20	
G00 X23 Z2	
G00 X19 Z2	
G01 X19 Z-20	
G00 X32 Z-20	
G26	
M5 M9	CLOSE
M0	
%	

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EXAMPLE 2 - CUT



Unit : mm

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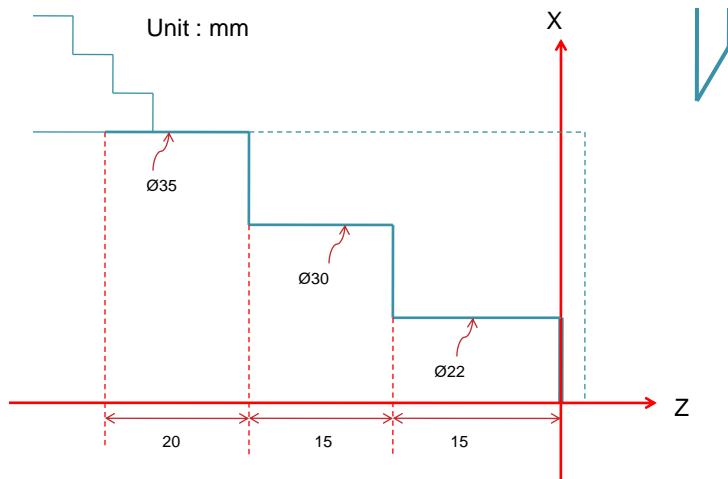
EXAMPLE 2- solution

%			
O 652	START		
G59 X0 Z190		G96 V200 T0101 M04	
G96 V200 T0202 M03		G92 S2000 M08	
G92 S2000 M08		G00 X32 Z-36.5	
G00 X32 Z0	FACING	G01 X26	
G01 X-1 Z0 F0.2		G00 X27	
G00 X26 Z2		G01 X22	
G01 X26 Z-20		G00 X23	CUT
G00 X27 Z-20		G01 X18	
G00 X27 Z2		G00 X19	
G00 X22 Z2	ROUGHING	G01 X14	
G01 X22 Z-20		G00 X15	
G00 X23 Z-20		G01 X10	
G00 X23 Z2		G00 X11	
G00 X19 Z2		G01 X6	
G01 X19 Z-20		G00 X7	
G00 X32 Z-20		G01 X2	
G26		G00 X3	
		G01 X0	
		G26	
		M5 M9	CLOSE
		M0	
		%	

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EXAMPLE 3



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EXAMPLE 3 - solution

START PROGRAMMED

```
%
O 5451
G59 X0 Z190
G96 V200 T0202 M03
G92 S2000 M08
FACING OBJECT
G00 X37 Z0
G01 X-1 Z0 F0.2
G00 X37 Z2
ROUGHING CYCLE
G71 P60 Q70 I0.02 K0.02 D1 F0.2
G26
```

SUB PROGRAMMED

```
N60
G46
G00 X0 Z0
G01 X22 Z0
G01 X22 Z-15
G01 X30 Z-15
G01 X30 Z-30
G01 X35 Z-30
G40
N70
G26
```

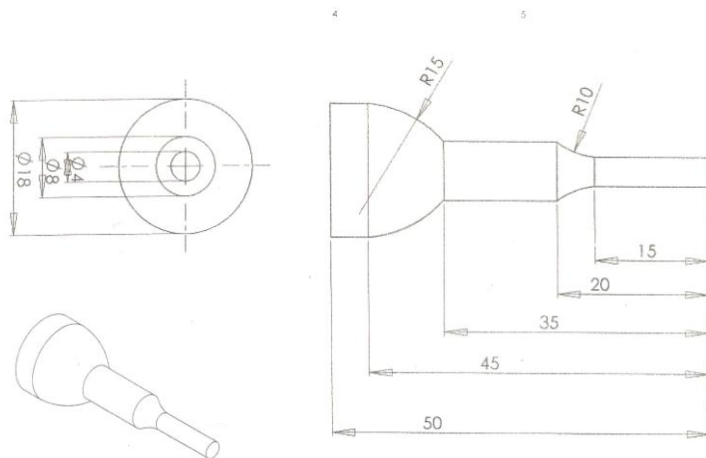
END PROGRAMMED

```
G26
M05 M09
M00
%
```

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EXAMPLE 4



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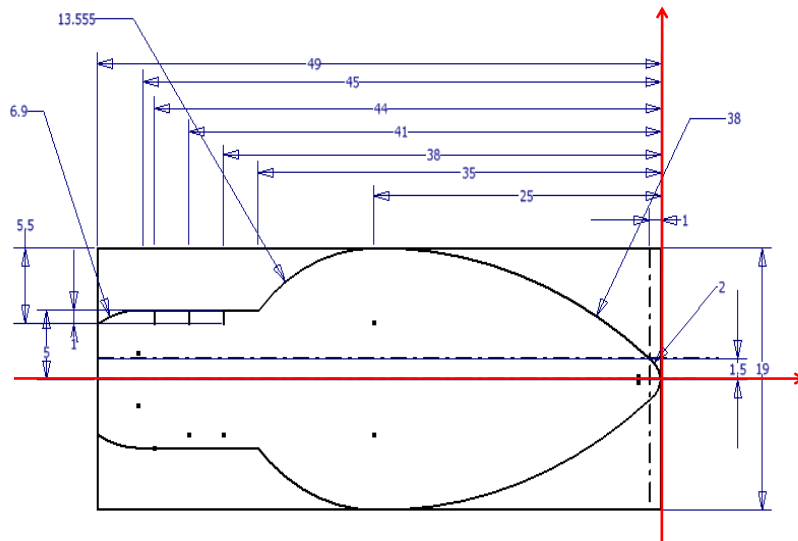
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EXAMPLE 4 - solution

```

%
O55
G59 X0 Z210
G96 V200 T0202 M03
G92 S2000 M08
G00 X20 Z0
G01 X-1 Z0 F0.2
G00 X20 Z0
G71 P80 Q90 I0.2 K0.2 D2 F0.2
G26
N80
G46
G00 X0 Z0
G01 X4 Z0
G01 X4 Z-15
G02 X8 Z-20 R10
G01 X8 Z-35
G03 X-18 Z-45 R15
G01 X-18 Z-50
G40
N90
G26
G96 V200 T0101 M04
G92 S2000 M08
G00 X20 Z-51.5
G01 X14
G00 X15
G01 X10
G00 X11
G01 X6
G00 X7
G01 X2
G00 X3
G01 X0
G26
M5 M9
M0
%
    
```

EXAMPLE 5- bulb



DATA REQUIRED - *bulb*

Program Number : O041

Rough part :

Diameter = 19mm

Length = 49mm

Tools

Facing = T0202

Roughing = T0202

Cutting = T0101

Cutting

Feed 0.5 mm/rev

Cont cutting rate 400mm/min

Working Zero Point G59

Chuck + jaw = 150mm

+ rough part = 49mm

+ clearance = 10mm

Zero point shift = 209mm

Metal working data

Facing

Feed 0.4 mm/rev

Speed 2000rpm

Cont cutting rate 200mm/min

Roughing

Feed 0.2 mm/rev

Cont cutting rate 200mm/min

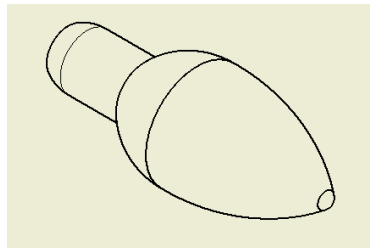
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EXAMPLE 5 - solution

```
%
O041
G59 X0 Z209
G96 V200 T0202 M03
G92 S2000 M08
G00 X21 Z0
G01 X-1 Z0 F0.4
G00 X21 Z2
G71 P70 Q80 I0.2 K0.2 D1 F0.2
G26
N70
G46
G00 X0 Z0
G03 X3 Z-1 R2
G03 X19 Z-25 R38
G03 X10 Z-35 R13.555
G01 X10 Z-45
G03 X8 Z-49 R6.9
G00 X12 Z-38
G01 X9 Z-38 G00 X12 Z-38
G00 X12 Z-41
G01 X9 Z-41
G00 X12 Z-41
G00 X12 Z-44
G01 X9 Z-44
G40
N80
G26
G96 V200 T0101 M04
G92 S2000
```

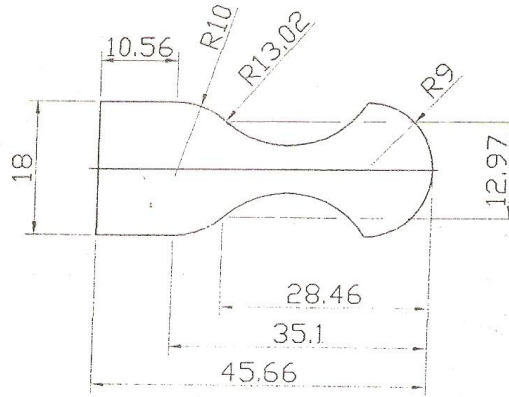
```
G00 X21 Z-50.5
G01 X15 F0.5
G00 X16
G01 X11
G00 X12
G01 X7
G00 X8
G01 X3
G00 X4
G01 X0
G26
M05 M09
M00
%
```



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EXERCISE I



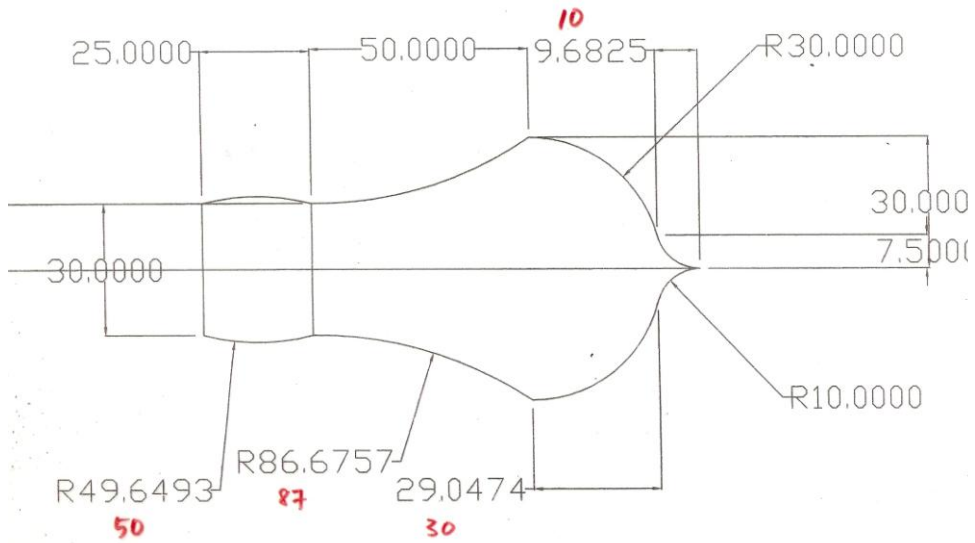
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EXERCISE 2

Kuliz : J4123

Masa: 20 m



EXERCISE 3

