Modular Course in Skill Development

BASIC MILLING

Credit-6

ASSIGNMENTS

DEVELOPMENT COMMISSIONER

MICRO, SMALL & MEDIUM ENTERPRISES
GOVT. OF INDIA
NIRMAN BHAVAN, NEW DELHI - 110108

CREDIT- 6

EXERCISE

Assignments:

This credit consists of practical exercises. The trainees have to do their self appraisal after finishing each practical exercise.

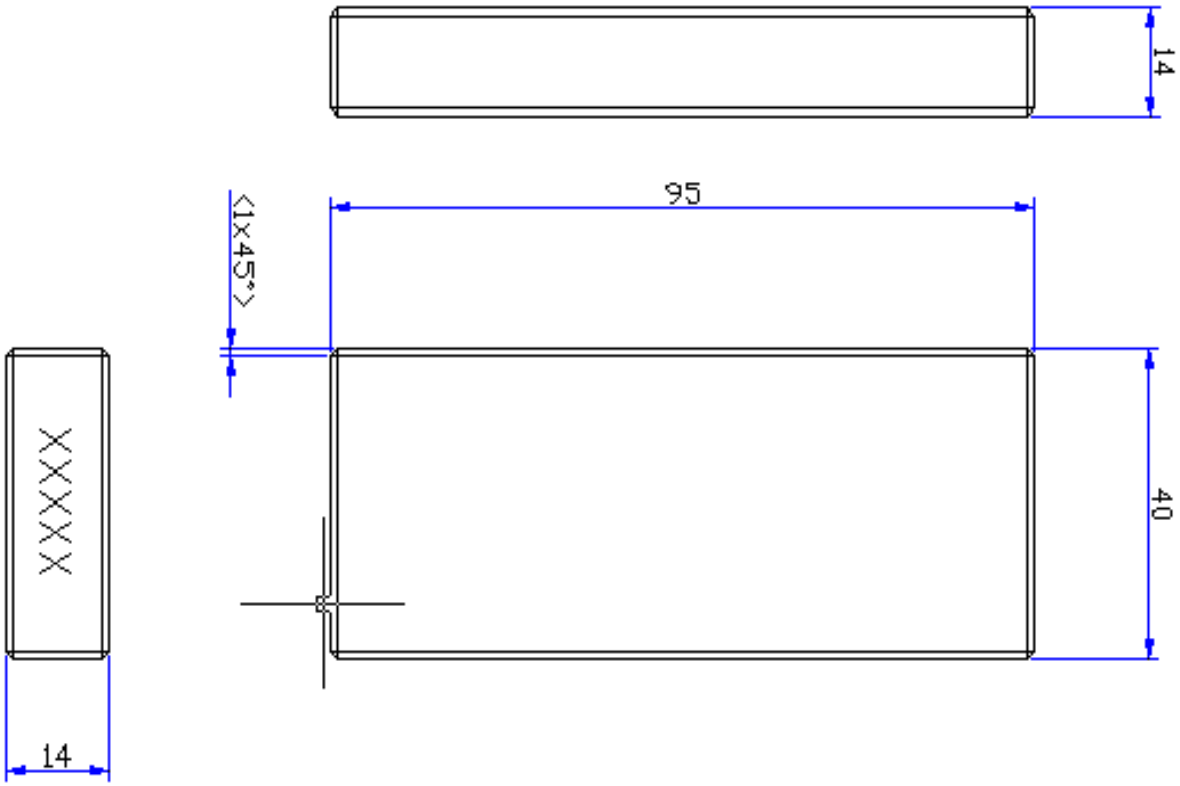
CREDIT 5

UNIT-1 Assignments for Practicals

1.1 ASSIGNMENTS:

EXERCISE NO. 1:

Manufacture the following job with proper dimension with 0.2 mm accuracy as per the given
drawing.



Aim: To Manufacture a Block as per Drawing.

Raw material size : MS Flat 20 x 45 x 100 mm

Finished size: 14 x 40 x 95 mm

Skills Covered	**Safety Precautions**
➢ Plain Milling ➢ Block Milling ➢ Deburring ➢ Oiling	➢ Know where to switch on/off and controls of machine before starting operation.

Tools Required

Cutting tools:

- End Mill Cutter Φ25mm
- Rough File 300mm long
- Copper Hammer

Measuring tools:

- Vernier Caliper 0-200mm, (0.02mm Least Count)

Working Steps

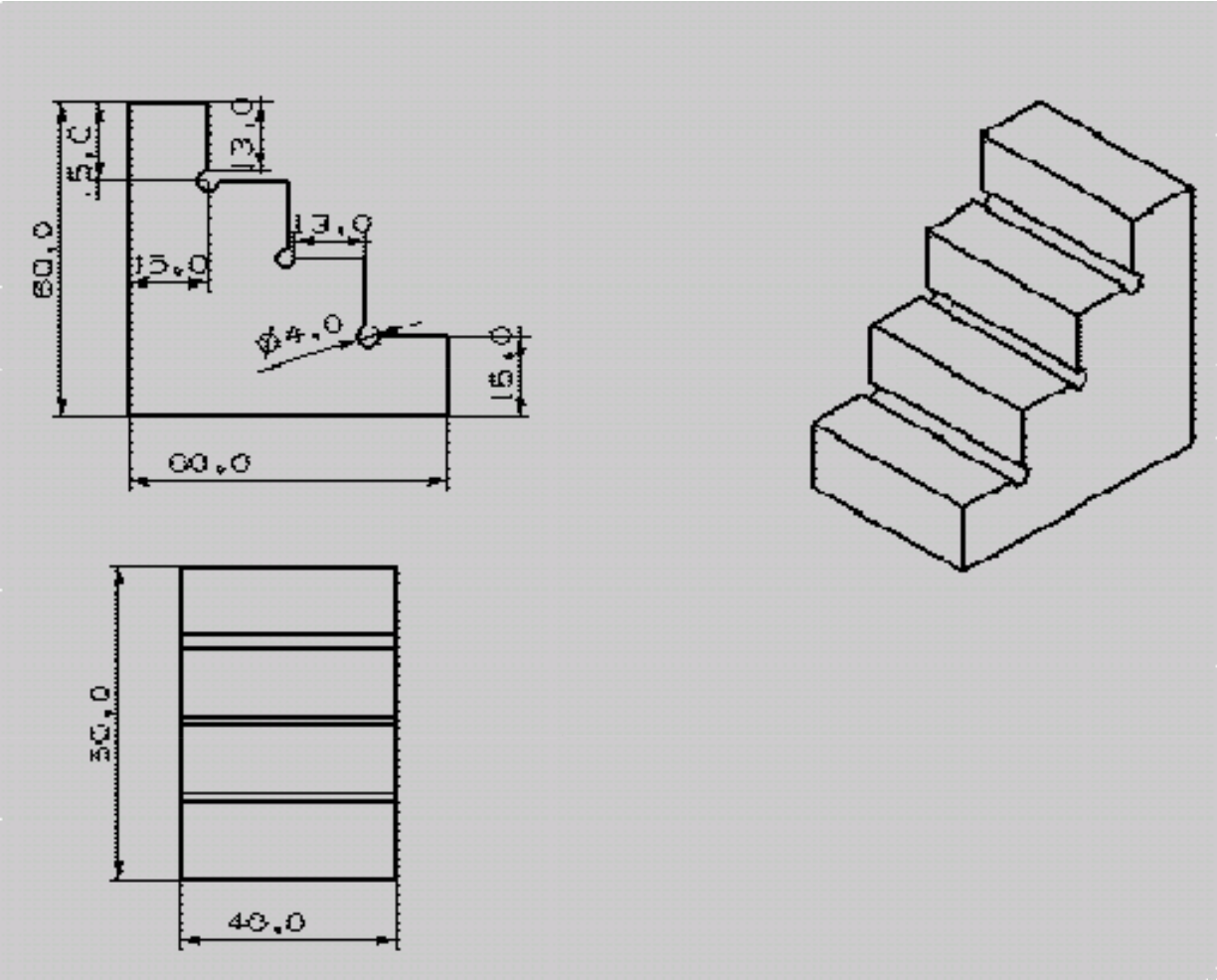
- Read the drawing carefully.
- Deburr the work piece and check the raw material dimensions.
- Clamp the work piece tightly in a vice.
- Make sure the cutter will not touch vice or clamping device.
- Clamp the cutting tool (end mill cutter Φ25mm) into the collet adapter.
- Make sure that the cutter and work piece are well clamped.
- Use parallel blocks where necessary.
- Select the RPM and Feed as per the calculations.
- Maintain the Width of 40mm by plain milling operation.
- Maintain the Thickness of 14mm by plain milling operation.
- Maintain the Length of 95mm by plain milling operation.
- Remove the work piece from the vice.
- Deburr the work piece, check the dimensions and store it at a proper place.
- Clamp the work piece in the vice tightly.
- Do not change the spindle speed while machine is in motion.
- When changing a cutting tool, make sure that the power is off.
- Do not touch revolving cutter with hands.
- Do not measure a work piece while the cutter is rotating near it or still cutting it.
- Do not remove guards while machine is still in process.
- Chips must be removed by brush not by hands.
- Do not remove chips wile machine is running.
- Do not lean on machine while running.
- Wear safety goggles while working on machine.
- Do not wear long sleeve clothes.
- Wear safety shoes.
- While working on machine, long hair should be bending properly.

PERFORMANCE ASSESTMENT SHEET:

SR.NO.	DESCRIPTION	DRAWING DIMENSIONS	MEASURED DIMENSIONS	
			1	2
1	LENGTH	95.0		
2	WIDTH	40.0		
4	HEIGHT	14.0		
5	CHAMFER	2 X 45°		
6	DEBURRING			

EXERCISE NO. 2:

Manufacture the following job with proper dimension with 0.2 mm accuracy as per the given drawing.



Aim: To Manufacture a Block as per Drawing.

Raw material size : MS Flat 65X65X45MM

Finished size: 60 x 60 x 40 mm

Skills Covered

- Plain Milling
- Block Milling
- Deburring
- Oiling

Tools Required

Cutting tools:

- HSS cutter
- Rough File 300mm long
- Drill Ø4.0mm
- Copper Hammer
- Vernier Caliper 0-200mm, (0.02mm Least Count)
- Try square

Measuring tools:

- Vernier Caliper 0-200mm, (0.02mm Least Count)

Work Techniques

- Drawing Reading
- Machine Parameters Setting
- Tool Parameters Setting
- Tool Holding Devices
- Work Holding Devices
- Block Milling Operation
- Marking Operation

Machine Used

- Vertical Milling Machine

Operation Sequence

- Block Milling
- Marking
- Drilling
- Step Milling

Working Steps

1. **Block Milling:**
2. Read the drawing carefully
3. Check all the dimensions of work piece
4. Hold the HSS cutter in a collet & adapter & fitted in a machine spindle with the help of c – spanner
5. Clamp the work piece in the machine vice with the help of vice handle for maintaining the length
6. Take a clean cut on the work piece & remove the taper
7. Reverse the work piece & perform the block milling to maintain the length of work piece up to (60.0)mm
8. Then clamp the work piece from that side in which we can maintain the width of work piece
9. Reverse the work piece & set with try square at a right angle to milled part
10. then maintain width of a work piece up to(60.0)mm
11. Then remove work piece to maintain the
12. Thickness the hold it properly with the parallel block such that equal length fixed in vice.
13. Then perform the operation to maintain
14. The thickness of work piece up (40.0) mm.
15. Remove the work piece from the vice.
16. Deburr the work piece, check the dimensions and store it at a proper place.

2. Marking and Drilling

1. First read the drawing carefully.
2. Then check all the dimensions of work piece and r-r sides.
3. Do the marking on the work piece with the help of vernier height gauge.
4. Do the centers punch on it.
5. Now set the position of drilling machine to perform the drilling operation according to the drawing with the below table & drills are situated.

Size Of Drill	X- Co-Ordinate	Y- Co-Ordinate	Reamers & Taps
Ø 4.0	15mm	45mm	Through
Ø 4.0	30mm	30mm	Through
Ø 4.0	45mm	15 mm	Through

Safety Precautions

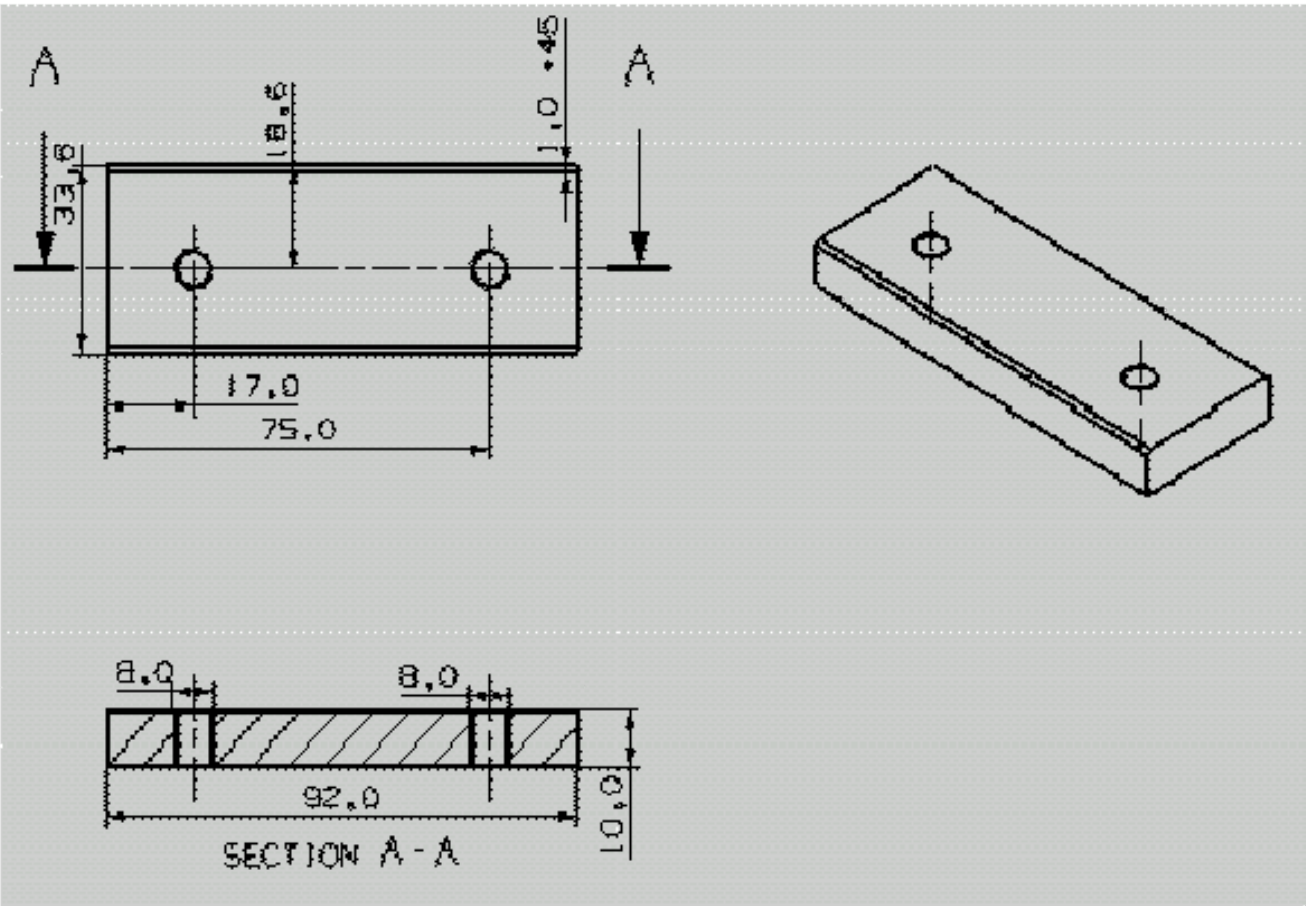
- Know where to switch on/off and controls of machine before starting operation.
- Clamp the work piece in the vice tightly.
- Do not change the spindle speed while machine is in motion.
- When changing a cutting tool, make sure that the power is off.
- Do not touch revolving cutter with hands.
- Do not measure a work piece while the cutter is rotating near it or still cutting it.
- Do not remove guards while machine is still in process.
- Chips must be removed by brush not by hands.
- Do not remove chips wile machine is running.
- Do not lean on machine while running.
- Wear safety goggles while working on machine.
- Do not wear long sleeve clothes.
- Wear safety shoes.
- While working on machine, long hair should be bending properly.

PERFORMANCE ASSESTMENT SHEET:

SR.NO.	DESCRIPTION	DRAWING DIMENSIONS	MEASURED DIMENSIONS	
			1	2
1	LENGTH	60.0		
2	WIDTH	60.0		
4	HEIGHT	40.0		
5	HOLE DIAMETER	DIA .4		
6	STEP	13.0		
7	DEBURRING			

EXERCISE NO. 3:

Manufacture the following job with proper dimension as per the given drawing.



Aim: To Manufacture a Block as per Drawing.

Raw material size : MS Flat 100X15X40MM

Finished size: 92 x 10 x 35 mm

Working Steps

1. **Block Milling:**

2. Read the drawing carefully
3. then check all the dimensions of work piece
4. Hold the HSS cutter in a collet & adapter & fitted in a machine spindle with the help of c – spanner
5. Clamp the work piece in the machine vice with the help of vice handle for maintaining the length
6. Take a clean cut on the work piece & remove the taper
7. Reverse the work piece & perform the block milling to maintain the length of work piece up to (92.0)mm
8. then clamp the work piece from that side in which we can maintain the width of work piece
9. reverse the work piece & set with try square at a right angle to milled part
10. then maintain width of a work piece up to (10.0)mm
11. Then remove work piece to maintain the thickness the hold it properly with the parallel block such that equal length fixed in vice
12. Then perform the operation to maintain the thickness of work piece up (33.6) mm.
13. Remove the work piece from the vice.
14. Deburr the work piece, check the dimensions and store it at a proper place.

2. Marking, Drilling and Tapping

1. first read the drawing carefully
2. Then check all the dimensions of work piece and r-r sides.
3. Do the marking on the work piece with the help of vernier height gauge.
4. Do the centers punch on it.
5. Now set the position of drilling machine to perform the drilling operation according to the drawing with the below table & drills are situated.
6. Then hold the w/p in bench vice for tapping hold the m8 tap in tap wrench and perform tapping operation.

size of drill	**x- co-ordinate**	**y- co-ordinate**	**reamers & taps**
ø 6.8	17mm	33.6mm	tapping M8
ø 6.8	75mm	33.6mm	tapping M8

Tools Required

- End Mill Cutter Φ25mm
- Rough File 300mm long. Round file
- Copper Hammer
- Drill of Dia. 6.8mm
- Tap set M8
- Vernier Caliper 0-200mm, (0.02mm Least Count)
- Angle plate
- Vernier height gauge 0- 250mm

Safety Precautions

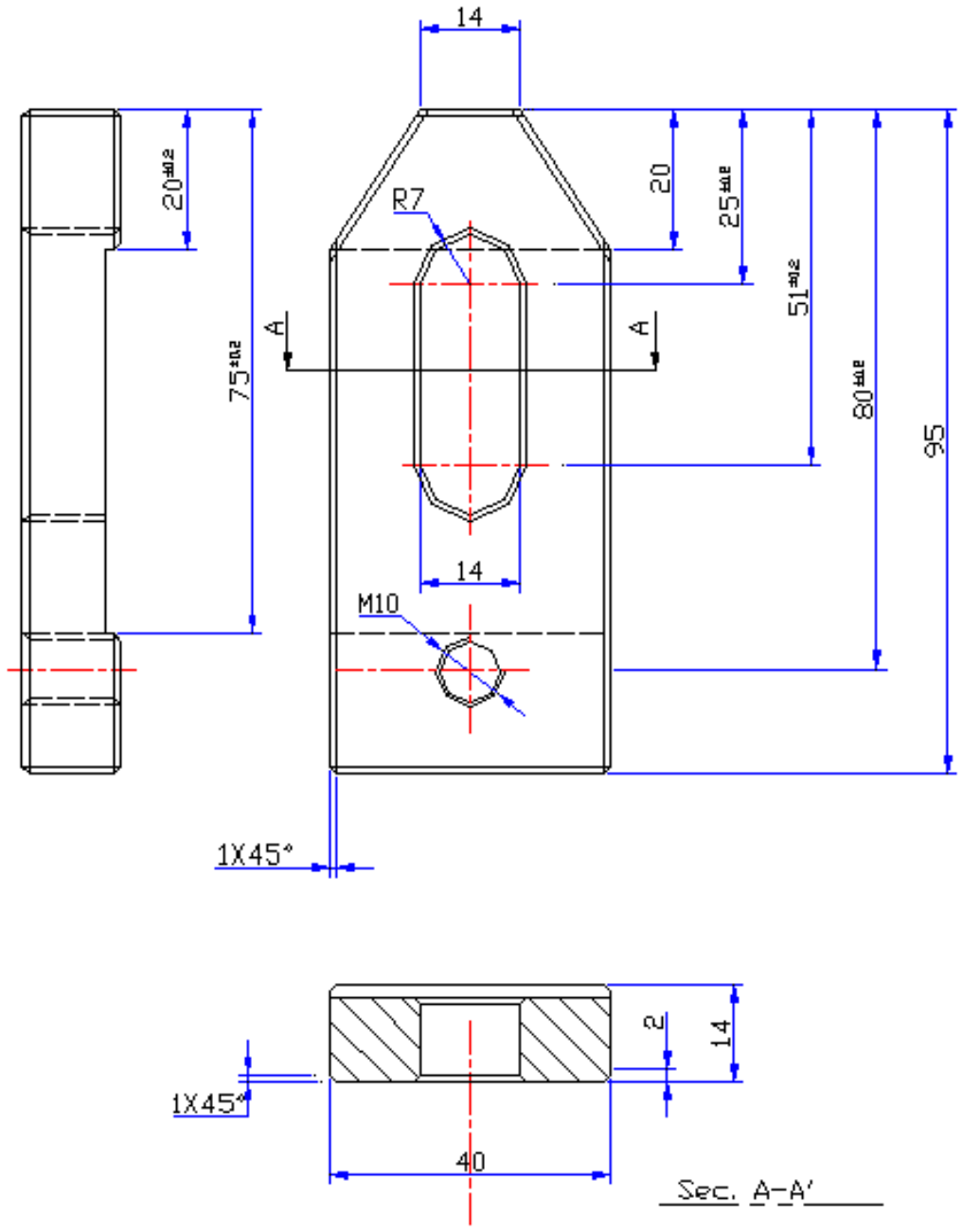
- Know where to switch on/off and controls of machine before starting operation.
- Clamp the work piece in the vice tightly.
- Do not change the spindle speed while machine is in motion.
- When changing a cutting tool, make sure that the power is off.
- Do not touch revolving cutter with hands.
- Do not measure a work piece while the cutter is rotating near it or still cutting it.
- Do not remove guards while machine is still in process.
- Chips must be removed by brush not by hands.
- Do not remove chips wile machine is running.
- Do not lean on machine while running.
- Wear safety goggles while working on machine.
- Do not wear long sleeve clothes.
- Wear safety shoes.
- While working on machine, long hair should be bending properly.

PERFORMANCE ASSESTMENT SHEET:

SR.NO.	DESCRIPTION	DRAWING DIMENSIONS	MEASURED DIMENSIONS	
			1	2
1	LENGTH	92.0		
2	WIDTH	33.6		
3	HEIGHT	10.0		
4	HOLE DIAMETER	DIA. 8.0		
5	CHAMFER	1 X 45°		
6	DEBURRING			

EXERCISE NO. 4:

Manufacture the following job with proper dimension as per the given drawing.



Aim: To Manufacture a Block as per Drawing.

Raw material size : MS Flat 20x45x100 mm

Finished size: 14 x 40 x 95 mm

Working Steps

- Read the drawing carefully.
- Deburr the work piece and check the raw material dimensions.
- Clamp the work piece tightly in a vice.
- Make sure the cutter will not touch vice or clamping device.
- Clamp the cutting tool (end mill cutter Φ25mm) into the collet adapter.
- Make sure that the cutter and work piece are well clamped.
- Use parallel blocks where necessary.
- Select the RPM and Feed as per the calculations.
- Maintain the Width of 40mm by plain milling operation.
- Maintain the Thickness of 14mm by plain milling operation.
- Maintain the Length of 95mm by plain milling operation.
- Give chamfer of 1 x 45°
- Do the angular milling
- Do the marking at a distance of 20mm along width by using angle plate & vernier height gauge.
- Do the marking at a distance of 80 mm, 50 mm & 25 mm along width by using angle plate & vernier height gauge.
- Make a centre punch.
- Drill the hole of dia 8.5 mm, do the tapping.
- Do the chain drilling of dia. 14 mm.
- Remove the remaining material by using file & maintain the slot width 14 mm
- Remove the work piece from the vice.
- Deburr the work piece, check the dimensions and store it at a proper place.

Tools Required

- End Mill Cutter Φ25mm
- Rough File 300mm long. Round file
- Copper Hammer
- Drill of Dia. 14 mm & 8.5 mm
- Tap set M10
- Vernier Caliper 0-200mm, (0.02mm Least Count)
- Angle plate
- Vernier height gauge 0- 250mm

Safety Precautions

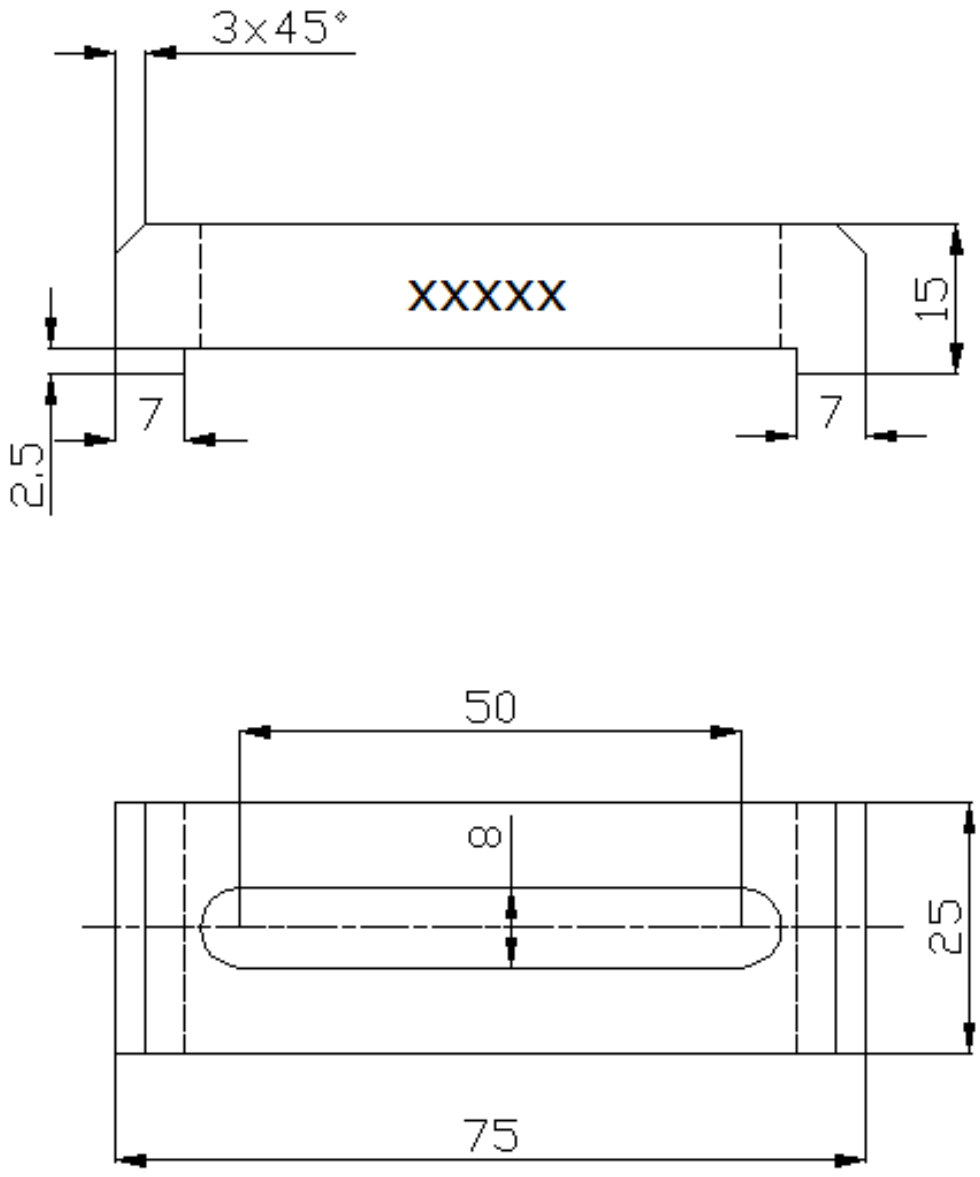
- Know where to switch on/off and controls of machine before starting operation.
- Clamp the work piece in the vice tightly.
- Do not change the spindle speed while machine is in motion.
- When changing a cutting tool, make sure that the power is off.
- Do not touch revolving cutter with hands.
- Do not measure a work piece while the cutter is rotating near it or still cutting it.
- Do not remove guards while machine is still in process.
- Chips must be removed by brush not by hands.
- Do not remove chips wile machine is running.
- Do not lean on machine while running.
- Wear safety goggles while working on machine.
- Do not wear long sleeve clothes.
- Wear safety shoes.
- While working on machine, long hair should be bending properly.

PERFORMANCE ASSESTMENT SHEET:

SR.NO.	DESCRIPTION	DRAWING DIMENSIONS	MEASURED DIMENSIONS	
			1	2
1	LENGTH	95.0		
2	LENGTH	75.0		
3	LENGTH	20.0		
4	WIDTH	40.0		
5	WIDTH	14.0		
6	HEIGHT	14.0		
7	DEPTH	02.00		
8	HOLE DIAMETER	DIA .14		
9	TAPPING	M10		
10	CHAMFER ALL OVER	1 X 45°		
11	DEBURRING			

EXERCISE NO. 5:

Manufacture the following job with proper dimension as per the given drawing.



Aim: To Manufacture a Block as per Drawing.

Raw material size : MS Flat 20 x 30 x 80 mm

Finished size: 15 x 25 x 75 mm

Working Steps

- Read the drawing carefully.
- Deburr the work piece and check the raw material dimensions.
- Clamp the work piece tightly in a vice.
- Make sure the cutter will not touch vice or clamping device.
- Clamp the cutting tool (end mill cutter Φ25mm) into the collet adapter.
- Make sure that the cutter and work piece are well clamped.
- Use parallel blocks where necessary.
- Select the RPM and Feed as per the calculations.
- Maintain the Width of 25mm by plain milling operation.
- Maintain the Thickness of 15mm by plain milling operation.
- Maintain the Length of 75mm by plain milling operation.
- Give chamfer of 3 x 45°
- Machine a slot of 2.5 mm depth & 61 mm length.
- Do the marking at a distance of 12.5 mm along width by using angle plate & vernier height gauge.
- Do the marking at a distance of 12.5 mm, & 62.5 mm along length by using angle plate & vernier height gauge.
- Make a centre punch.
- Do the chain drilling of dia. 8 mm.
- Remove the remaining material by using file & maintain the slot width 8
- Remove the work piece from the vice.
- Deburr the work piece, check the dimensions and store it at a proper place.

Tools Required

- End Mill Cutter Φ25mm
- Rough File 300mm long. Round file
- Copper Hammer
- Drill of Dia. 8 mm &
- Vernier Caliper 0-200mm, (0.02mm Least Count)
- Angle plate
- Vernier height gauge 0- 250mm

Safety Precautions

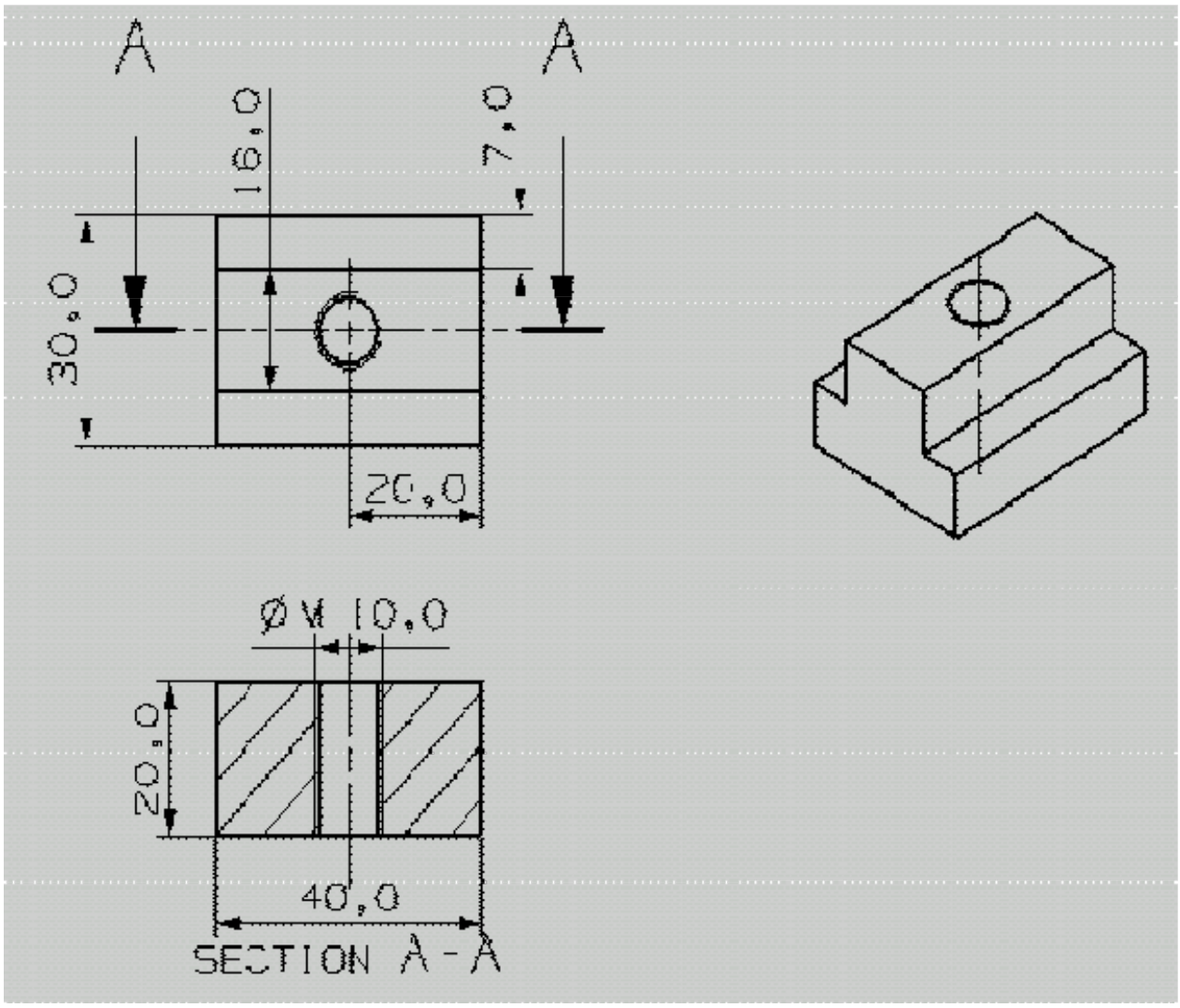
- Know where to switch on/off and controls of machine before starting operation.
- Clamp the work piece in the vice tightly.
- Do not change the spindle speed while machine is in motion.
- When changing a cutting tool, make sure that the power is off.
- Do not touch revolving cutter with hands.
- Do not measure a work piece while the cutter is rotating near it or still cutting it.
- Do not remove guards while machine is still in process.
- Chips must be removed by brush not by hands.
- Do not remove chips wile machine is running.
- Do not lean on machine while running.
- Wear safety goggles while working on machine.
- Do not wear long sleeve clothes.
- Wear safety shoes.
- While working on machine, long hair should be bending properly.

PERFORMANCE ASSESTMENT SHEET:

SR.NO.	DESCRIPTION	DRAWING DIMENSIONS	MEASURED DIMENSIONS	
			1	2
1	LENGTH	75.0		
2	LENGTH	07.0		
3	LENGTH	07.0		
4	WIDTH	25.0		
5	WIDTH	08.0		
6	HEIGHT	15.0		
7	DEPTH	02.50		
8	HOLE DIAMETER	DIA .08		
9	CHAMFER	3 X 45°		
10	DEBURRING			

EXERCISE NO. 6:

Manufacture the following job with proper dimension as per the given drawing.



Aim: To Manufacture a Block as per Drawing.

Raw material size : MS Flat 45X25X35MM

Finished size: 40 x 30 x 20 mm

Working Steps

1. Block Milling:

2. first read the drawing carefully
3. then check all the dimensions of work piece
4. now, hold the HSS cutter in a collet & adapter & fitted in a machine spindle with the help of c – spanner
5. Clamp the work piece in the machine vice with the help of vice handle for maintaining the length.
6. then ,take a clean cut on the work piece & remove the taper
7. reverse the work piece & perform the block milling to maintain the length of work piece up to (40.0)mm
8. then clamp the work piece from that side in which we can maintain the width of work piece
9. reverse the work piece & set with try square at a right angle to milled part
10. then maintain width of a work piece up to(20.0)mm
11. Then remove work piece to maintain the thickness the hold it properly with the parallel block such that equal length fixed in vice.
12. Then perform the operation to maintain the thickness of work piece up (30.0) mm.
13. Remove the work piece from the vice.
14. Deburr the work piece, check the dimensions and store it at a proper place.

2. Step Milling:

1. First read the drawing carefully then check all the dimensions of work piece
2. Now, hold the HSS cutter in a collet & adapter & fitted in a machine spindle with the help of c – spanner
3. Clamp the work piece in the machine vice with the help of vice handle.
4. Then perform the operation of step milling by giving the depth cut the material as per marking and make the steps.
5. After then remove the work piece from machine vice.

3. Marking, Drilling and Tapping

1. first read the drawing carefully
2. Then check all the dimensions of work piece and r-r sides.
3. Do the marking on the work piece with the help of vernier height gauge.
4. Do the centers punch on it.
5. Now set the position of drilling machine to perform the drilling operation according to the drawing with the below table & drills are situated.
6. Then hold the w/p in bench vice for tapping hold the m8 tap in tap wrench and perform tapping operation.

size of drill	**x- co-ordinate**	**y- co-ordinate**	**reamers & taps**
ø 8.8	20mm	15mm	tapping

Tools Required

- End Mill Cutter Φ25mm
- Rough File 300mm long. Round file
- Copper Hammer
- Drill of Dia. 8.8mm
- Tap set M10
- Vernier Caliper 0-200mm, (0.02mm Least Count)
- Angle plate
- Vernier height gauge 0- 250mm

Safety Precautions

- Know where to switch on/off and controls of machine before starting operation.
- Clamp the work piece in the vice tightly.
- Do not change the spindle speed while machine is in motion.
- When changing a cutting tool, make sure that the power is off.
- Do not touch revolving cutter with hands.
- Do not measure a work piece while the cutter is rotating near it or still cutting it.
- Do not remove guards while machine is still in process.
- Chips must be removed by brush not by hands.
- Do not remove chips wile machine is running.
- Do not lean on machine while running.
- Wear safety goggles while working on machine.
- Do not wear long sleeve clothes.
- Wear safety shoes.
- While working on machine, long hair should be bending properly.

PERFORMANCE ASSESTMENT SHEET:

SR.NO.	DESCRIPTION	DRAWING DIMENSIONS	MEASURED DIMENSIONS	
			1	2
1	LENGTH	40.0		
2	WIDTH	30.0		
3	WIDTH	16.0		
4	TAPPING	M10		
5	DEBURRING			