

ME2258- MANUFACTURING TECHNOLOGY-II
LABORATORY MANUAL
FOR IV SEMESTER MECHANICAL
(FOR PRIVATE CIRCULATION ONLY)
ANNA UNIVERSITY – CHENNAI

DEPARTMENT OF MECHANICAL ENGINEERING
DR. NAVALAR NEDUNCHEZHIAN COLLEGE OF ENGINEERING
THOLUDUR – 606 303, CUDDALORE DISTRICT

LIST OF EQUIPMENTS

1. Centre Lathe with accessories 2
2. Turret and capstan lathes 2
3. Horizontal milling machine 1
4. Vertical milling machine 1
5. Surface grinding machine 1
6. Cylindrical grinding machine 1
7. Shaper 2
8. Slotter 1
9. Planner 1
10. Radial drilling machine 1
11. Tool dynamometer 1
12. Gear hobbing machine 1
13. Tool makers microscope 1

UNIVERSITY PRACTICAL EXAMINATIONAllotment of Marks

Internal Assessment	= 20 marks
Practical Examination	= 80 marks
Total	=100 marks

INTERNAL ASSESSMENT [20 Marks]

Staff should maintain the assessment Register and the Head of the Department should monitor it.

SPLIT UP OF INTERNAL MARKS

Observation	= 3 marks
Record Note	= 7 marks
Model Exam	= 5 marks
Attendance	= 5 marks

Total = 20 marks

UNIVERSITY EXAMINATION(80 Marks)

The examination will be conducted for 100 marks. Then the marks will be converted to 80 marks.

Split up of Practical Examination Marks

Aim and Procedure	= 20 marks
Job Finishing	= 70 marks
Viva -Voce	= 10 marks
Total	= 100 marks

GENERAL INSTRUCTIONS FOR LABORATORY CLASSES

- Enter Lab with **CLOSED FOOTWEAR**
- Boys should “**TUCK IN**” the shirts
- Students should wear **uniform only**
- **LONG HAIR** should be protected, let it not be loose especially *near*
ROTATING MACHINERY.
- Any other machines/ equipments **should not be operated** other than the prescribed one for that day.
- **POWER SUPPLY** to your test table should be obtained only through the **LAB TECHNICIAN**
- Do not **LEAN** and do not be **CLOSE** to the rotating components.
- **TOOLS, APPARATUS & GUAGE** Sets are to be returned before leaving the Lab.
- **HEADINGS & DETAILS** should be neatly written
 1. Aim of the experiment
 2. Apparatus / Tools/ Instruments required
 3. Procedure / Theory / Algorithm / Program
 4. Model Calculations
 5. Neat Diagram/ Flow charts
 6. Specifications/ Designs details
 7. Tabulation
 8. Graph
 9. Result/ Discussions
- Before doing the experiment, the student should get the circuit/ Program approval by the
FACULTY-IN-CHARGE
- **Experiment date** should be written int the appropriate place
- After completing the experiments, the answer to the VIVA-VOCE Questions should be neatly written in the workbook
- Be **PATIENT, STEADY, SYSTEMATIC, & REGULAR**

ME2258 – MANUFACTURING TECHNOLOGY LABORATORY II**L T P C****0 0 3 2**

1. Two or more measurements in metal cutting Experiment [Example: Shear angle, cutting force, Tool Wear etc.]
2. One or more exercises in Shaper, Slotter, Planner, Drilling, Milling machines [Example: Round to Square, Dovetail in shaper, internal keyway cutting in Slotter, Round to square in Planner, Drilling, reaming and tapping in Drilling machine, Gear milling and key way milling in Milling machine]
3. Two or more exercises in Grinding/Abrasive machining [Example: Surface grinding, cylindrical grinding]
4. Two or more exercises in assembly of machined components for different fits. [Example: parts machined using lathes, shapers, drilling, milling and grinding machines etc.]
5. One or more exercises in Capstan or Turret lathes.
6. One or more exercises in Gear machining. [Example: Gear milling, Gear Hobbing etc.]

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Signature of the Lab In charge
(N.GANESH)

STUDY OF MILLING MACHINE

AIM

To study the working principle of milling machine.

MILLING MACHINE

A milling machine is one of the most important machine tools. It remove metals from the work piece it fed against rotating cutting tool used. In milling machine it has multiple cutting edge which removes metal at a faster rate milling machine point of application in the production of gears and cutting tool.

TYPES OF MILLING MACHINE

The milling machine classified as follows:

- 1)Column and knee type
- 2)Horizontal milling machine
 - a)vertical milling machine
 - b)Universal milling machine
- 3)Bed type milling machine
- 4)planer type

PRINCIPLE OPERATIONS AND PARTS OF A MILLING MACHINE

The principle parts of the column and knee type milling machines are as follows:

BASE

It is a foundation of machine. It carries the column and give strength and rigidity to the machine it serves as the reservoir for cutting fluid.

COLUMN

It is the main supporting frame movement vertically on the base.

KNEE

It projects from column and sides up and down on the vertical guide ways of column in turns support the saddle and knee table. The vertical position of the knee can be adjusted by an elevating screw provided at the bottom of the knee.

SADDLE

It support the table and can be adjusted transversely on the guide ways provided on the top surface of the knee. These guide ways are exactly at 90° to the face of the column.

TABLE

It slides on the guide ways of saddle and travels longitudinally in a horizontal plane. It supports the work piece and other features on it.

OVERHANGING ARM

It is mounted on the top of the column in turn extend beyond the column face.

ARBOR

It may be considered as extension of the spindle.

MILLING OPERATIONS:

The different types of operations that can be performed in milling machine are given below:

- Plain milling
- Angular milling
- Face and side milling
- Gang milling
- End milling
- Straddle milling.

PLAIN MILLING

It is a method of producing flat surface. It is parallel to the axis of the cutter. It is held in the milling arbor.

FACE AND SIDE MILLING

It is a method of producing flat surface right angle to the axis of cutter and in turn in this method large flat surface can be obtained.

GANG MILLING

It is a method of milling by using two or more cutters arrangement together on one arbor. It is used the similar pieces must be made.

ANGULAR MILLING

It is a method of producing a flat surface at an angle to the axis of the cutter. Angular surface are milled by tilting the spindle.

END MILLING

It is a method of milling slots keyway surface by end mills and also it is used in milling cutters.

STRADDLE MILLING

It is a method of milling to parallel slides at a work by employing to side milling.

SHAPER**PRINCIPLE OF OPERATION:**

The shaper which is having a reciprocating type of machine tool with single point cutting tool used to produce flat surface. The flat surface may be horizontal, vertical or inclined. It has three important parts such as

1.Table, 2.Tool head, 3. Ram

The tool head is fitted on the front on the ram while the job is rightly fixed on the table. The tool is mounted on the tool post or head. The ram reciprocates along with the tool to remove the metal in the forward stroke called as cutting stroke. The tool does not cut the metal in the return stroke called as idle stroke. Therefore one pass is nothing but the combination of one forward and return stroke or one cutting and one idle stroke. So we are in a position to reduce idle stroke time by increasing the speed of the return stroke. That is the speed of cutting stroke will be lower than the speed of the return stroke.

CLASSIFICATION OF SHAPERS:

Generally, shapers are classified as follows

1. According to the type of driving mechanism
 - a. crank drive type
 - b. Whitworth driving mechanism type
 - c. Hydraulic drive type
2. According to the position of ram
 - a. Horizontal shaper
 - b. Vertical shaper
 - c. Travelling head shaper
3. According to the table design
 - a. standard or plain shaper
 - b. Universal shaper
4. According to the type of cutting stroke
 - a. Push out type
 - b. Draw cut type

SHAPER SPECIFICATIONS:

Generally, the specifications of a typical shaper are listed below:

1. Maximum length of stroke.
2. Maximum crosswise movement of the table.
3. Maximum vertical adjustment of the table.
4. Type of driving mechanism
5. Power of the motor
6. Speed and feed available
7. Type of shaper-plain or universal
8. Floor space required
9. Total weight of the shaper.
10. Ratio of cutting stroke time to return stroke time.

UPRIGHT OR PILLAR DRILLING MACHINE

Upright drilling machine is a higher capacity version of sensitive drilling machine. It is a stationary floor mounted drilling machine. It is used for medium sized work pieces having medium speed. The spindle head and the drive arrangement in this machine are similar to a sensitive drilling machine.

BASE:

It is a supporting member on which all the parts of the machine are mounted. It is generally made of cast iron.

COLUMN:

It is a vertical member mounted on the base and carries table, Spindle and pulley drive mechanism. It should be very strong to take the heavy cutting forces. It may be round type or box type.

TABLE:

The worktable is attached to the column by means of clamping screw. It has T-slots on the surface to hold the work pieces. It can move vertically along the column and can be adjusted radially about the column.

SPINDLE HEAD AND DRIVE MECHANISM:

The spindle head is mounted on the top of the vertical column. It is driven by a motor through belt and step cone drive.

RESULT:

Thus the tools of Special Machines were studied in this experiment.

Experiment Number: 1

Title of the exercise : Making Square from round rod using Shaper

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To generate a square from rounded on the given work piece in a shaper machine.

FACILITIES REQUIRED AND PROCEDURE

a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	Punching machine	1
2.	Steel rule	1
3.	Hammer	1
4.	Shaper tool	1
5.	Try Square	1

bProcedure for doing the exercise:

Steps	
1.	The job was checked to the given dimensions.
2.	The square was scribed in the outer circle of diameter of 50mm and punching was done.
3.	The job was attached in the vice of a shaper
4.	The job was checked for perpendicular dimension.
5.	Then the square from round was obtained in the shaper
6.	The work piece was removed and burns are removed with accuracy was checked.

c. Figure

d.Result

Thus the square from round was performed on the given dimension in a shaper machine with the required dimensions.

Viva questions**1. What are the specifications of shaper?**

Maximum length of the stroke, power of the motor, floor space required, total weight of the shaper.

2. Define cutting stroke?

The ram reciprocates along with the tool to remove the metal in the forward stroke called cutting stroke.

3. What are the types of shaper?

Horizontal shaper, vertical shaper, travelling shaper.

4. What are the main components of shaper?

Base, column, cross rail, table.

5. Why the time for forward stroke is greater than return stroke?

The metal is removed in the forward stroke, but no metal is cut during the return stroke. So the time for forward stroke is high.

Experiment Number: 2

Title of the exercise : Drilling, Tapping, and Reaming in Radial drilling machine

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To make drilling, tapping and Reaming in the given work piece for the required dimensions.

FACILITIES REQUIRED AND PROCEDURE

a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	Steel rule	1
2.	Flat file(rough and smooth)	1
3.	Drill bit(8 mm, 10 mm, 10.5 mm)	1
4.	Reaming tool	1
5.	Try square	1

b.Procedure for doing the exercise:

Steps	
1.	The work piece was fitted in the vice and filed to the required dimensions.
2.	The squareness of the work piece was checked.
3.	Drawing punches were made for various drills.
4.	The job was fitted on the radial drilling machine.
5.	The 20 mm ,10.5 mm,8 mm, 6.5 mm-drill bit were used for drilling in the required place and drilling operation were made on the work piece.
6.	Reaming was done on the 8 mm hole using the Reaming tool size of 8 mm diameter. And tapping was done on the 6.5 mm drill and 10.5 mm drill. The work piece was removed from the radial drilling machine.

c. Figure

d.Result

Thus the given job was drilled, tapped and Reaming to the required dimensions.

Viva questions:**1. What are the components in radial drilling?**

Base, column, radial arm, drill head.

2. What is meant by tapping?

Tapping is the operation of cutting internal threads in hole by cutting tool .

3. What is meant by counter boring?

The operation of enlarging of end of hole cylindrically is known as counter boring.

4. What is meant by counter sinking?

The operation of making a cone shaped enlargement of end a hole known as counter sinking.

5. What are the specifications of radial drilling machine?

Maximum size of drill head, Maximum spindle travelling, Power input of the machine(H.P), Floor space required m^2 .

Experiment Number: 3

Title of the exercise : Dove tail machining in shaper

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To perform a dove tail fitting on the given work piece by shaper machine.

FACILITIES REQUIRED AND PROCEDURE

a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	Steel rule	1
2.	Scriber	1
3.	Dot punch	1
4.	Try square	1
5.	Parting tool	1

b.Procedure for doing the exercise:

Steps	
1.	Initially the given work piece is checked for its dimensions.
2.	The dove tail surfaces are marked using scriber to given dimensions, then punched.
3.	The job is fixed on a vice of the shaper to name external dove tail.
4.	The vertical slide of the tool head is swiveled to the required angle from vertical position.
5.	The apron is further swiveled away from the work so that the tool will clear the work during return stroke.
6.	The angular down feed is given to the required depth of cut and length of stroke is adjusted.
7.	The above procedure is respected to obtain an internal dove tail part.
8.	Then the work piece is removed and assembled for dove tail fit.

c. Figure

d. Result:

Thus the dove tail [internal and external] part were made to the given dimensions and assembled to obtain dove tail fit assembly.

Viva questions:**1. What are the specifications of shaper?**

Maximum length of the stroke, power of the motor, floor space required, total weight of the shaper.

2. Define cutting stroke?

The ram reciprocates along with the tool to remove the metal in the forward stroke called cutting stroke.

3. What are the types of shaper?

Horizontal shaper, vertical shaper, travelling shaper.

4. What are the main components of shaper?

Base, column, cross rail, table.

5. Why the time for forward stroke is greater than return stroke?

The metal is removed in the forward stroke, but no metal is cut during the return stroke. So the time for forward stroke is high.

Experiment Number: 4

Title of the exercise : Internal key way cutting in slotter

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To cut Internal key to the required dimensions in slotting machine to accommodate key.

FACILITIES REQUIRED AND PROCEDURE

a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	Steel rule	1
2.	Tipped tool	1
3.	Scriber	1
4.	Dot punch	1
5.	Anvil	1
6.	Surface gauge	1
7.	Steel rule	1

b. Procedure for doing the exercise:

Steps	
1.	The dimensions of the given work piece are checked as per the requirements.
2.	Key and key way dimensions in proportionate to shaft diameter found.
3.	Key way dimensions are marked over the shaft then permanent mark are made using dot punch.
4.	Key way is machined in slotter machine to the required dimensions.

c. Figure

d.Result:

Thus the internal key way to the required dimension is cut in slotter.

Viva questions:**1. Write any six specifications in slotter machine?**

Maximum stroke length, Diameter of rotary table, Type of drive used, Power rating motor, Net weight of machine, Floor area required.

2. What are the uses of slotter?

Key way, Bit tool, Heavy tool holders.

3. Why the time for forward stroke is greater than the return stroke?

In slotter, down stroke is the cutting stroke. The return stroke is idle. To reduce the idle return time, quick return mechanism is used.

4. What is the difference between shaper and slotter?

Sl.No	Shaper	Slotter
1.	Rotary table along with tools will remove.	Slides will remove to perform slotting.
2.	Vertical shaper is not fixed in the vertical plane.	Slotter is fixed in the vertical plane.

5. What are the main components in slotting machine?

Base, Column, Saddle, Rotary table, Ram and tool head.

Experiment Number: 5

Title of the exercise : Spur Gear milling

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To perform a spur gear milling operation in milling machine.

FACILITIES REQUIRED AND PROCEDURE

a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	Steel rule	1
2.	Milling cutter	1
3.	Spanner	1
4.	Mandrel	1
5.	Dog carrier	1

b. Procedure for doing the exercise:

Steps	
1.	The raw blank is selected with reference to the number of teeth to be cut.
2.	Indexing number is calculated to the position of the blank.
3.	Gear blank is mounted on mandrel in milling machine.
4.	Centering of the blank is done by upward and cross feed.
5.	The depth of the cut is calculated for the given module.

c. Figure

d. Result:

Thus the spur gear cutting is performed in a milling machine.

Viva questions:**1. What are the main components in milling machine?**

Base, column, knee, saddle, table.

2. Write any six specifications in milling machine?

The table length and width, power of driving motor, spindle nose taper size, type of milling machine, floor space and net weight.

3. What are the types of milling machine?

Plain milling machine, vertical milling machine, universal milling machine, simplex milling machine, triplex milling machine.

4. What are the types of milling cutter?

Plain milling cutter, slide milling cutter, arbor cutters, shank cutters, face cutters.

5. What is the purpose of indexing head?

The work piece held between centre of head stock and tail stock. Short work pieces are held in chuck fitted to head stock spindle.

Experiment Number: 6

Title of the exercise : Machining for press fit

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To perform a machining operation for press fit in lathe machine.

FACILITIES REQUIRED AND PROCEDURE

a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	HSS Single point cutting tool	1
2.	Vernier caliper	1
3.	Steel rule	1
4.	Chuck key	1
5.	Tool post key	1
6.	Drill bit socket	1

b. Procedure for doing the exercise:

Steps	
1.	The given work piece is cut into two pieces to make an assembly with chuck key for its dimensions.
2.	The end is faced and chucked for the centering of the tool.
3.	The cutting tool is tightened by 30 for facing operation.
4.	The step turning operation is repeated in the shaft to get accurate dimension by giving the gradual depth of cut and feeds,
5.	The dimensions are checked by using the vernier caliper as per the specifications.
6.	The above procedure is repeated with drill bit of 14 mm dia.

c. Figure

d. Result:

Thus the job was finished and checked for assembly.

Viva questions:**1. What is meant by lathe?**

Lathe is a machine which removes the metal from a piece of work to the required shape and size.

2. Write any six specifications in lathe machine?

The length of bed, swing over bed, swing over the cross slide, width of bed, spindle bore, spindle speed.

3. What are the main operations in lathe?

Turning, Facing, Forming, Reaming, chamfering, Boring, Knurling.

4. Why lathe bed is made up of cast iron?

To improve high strength.

5. What are the components of a lathe?

Bed, head stock, tail stock, carriage, feed mechanism.

Experiment Number: 7

Title of the exercise : Grinding to the required accuracy by surface grinding

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To perform a grinding operation in surface grinding machine.

FACILITIES REQUIRED AND PROCEDURE

a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	Steel rule	1
2.	Try square	1
3.	Vernier caliper	1

b. Procedure for doing the exercise:

Steps	
1.	The given work piece is taken and checked for its dimensions.
2.	The job is placed on the grinding magnet at opened position.
3.	Then each face is grinded to the required accuracy by constant speed.
4.	The job is removed from the required accuracy. It is checked by using vernier caliper and squareness is checked by using trysquare.

c. Figure

d. Result:

Thus the square section is grinded to the required accuracy in grinding machine.

Viva questions:**1. What is meant by surface grinding?**

Surface grinding machines are useful to produce and finish flat and plane surface.

2. What are the types of grinding machines?

Transverse grinding, Plunger grinding.

3. How the grinding wheel is made?

It is made up of abrasive material.

4. What is the purpose of magnetic chuck?

Magnetic chuck is one type work holding devices. The chucks get magnetic power from electro magnet.

Experiment Number: 8

Title of the exercise :

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To perform a cylindrical job using cylindrical grinding machine.

FACILITIES REQUIRED AND PROCEDURE

a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	Steel rule	1
2.	Vernier caliper	1
3.	Outside caliper	1
4.	Surface plate	1

b. Procedure for doing the exercise:

Steps	
1.	The given work piece is taken and checked for its dimensions.
2.	The work piece is fixed in between the live and dead centre and is rotated.
3.	Machining is done by the movement of grinding wheel head into the work piece.
4.	Remove the job and check its dimensional accuracy.

c. Figure

d. Result:

Thus the cylindrical job was done to the required accuracy in a cylindrical grinding machine.

Viva questions:**1. What is meant by surface grinding?**

Surface grinding machines are useful to produce and finish flat and plane surface.

2. What are the types of grinding machines?

Transverse grinding, Plunger grinding.

3. How the grinding wheel is made?

It is made up of abrasive material.

4. What is the purpose of magnetic chuck?

Magnetic chuck is one type work holding devices. The chucks get magnetic power from electro magnet.

Experiment Number: 9

Title of the exercise : Machining for clearance Fit

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To perform a machining operation for clearance fit in lathe machine.

FACILITIES REQUIRED AND PROCEDURE

a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	HSS Single point cutting tool	1
2.	Vernier caliper	1
3.	Steel rule	1
4.	Chuck key	1
5.	Drill bit socket	1
6.	Surface gauge	1

b. Procedure for doing the exercise:

Steps	
1.	The given work piece is taken and checked for its dimensions.
2.	In the shaft facing, turning, grooving, thread cutting operation were done to the required dimensions.
3.	To obtain the required hole dimension pilot drill is properly fixed in the tail stock. The drill is moved along the axis of the job to carry out the drilling operation.
4.	External thread cutting operation is carried out to the required TPI.
5.	Finally the matching parts are fitted together to check assembly.

c. Figure

d. Result:

The jobs were finished to the required dimensions and assembly.

Viva questions:**1. What is meant by lathe?**

Lathe is a machine which removes the metal from a piece of work to the required shape and size.

2. Write any six specifications in lathe machine?

The length of bed, swing over bed, swing over the cross slide, width of bed, spindle bore, spindle speed.

3. What are the main operations in lathe?

Turning, Facing, Forming, Reaming, chamfering, Boring, Knurling.

4. Why lathe bed is made up of cast iron?

To improve high strength.

5. What are the components of a lathe?

Bed, head stock, tail stock, carriage, feed mechanism.

Experiment Number: 10

Title of the exercise : Making Bevel Gear

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To make a bevel gear in milling machine.

FACILITIES REQUIRED AND PROCEDURE

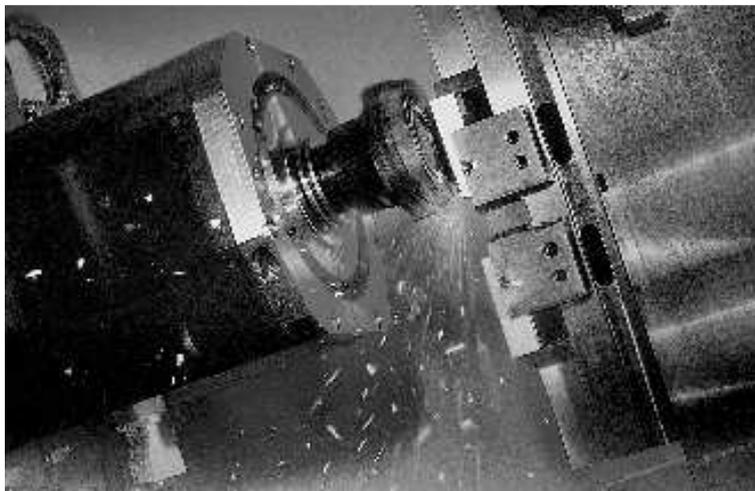
a. Facilities/material required to do the exercise:

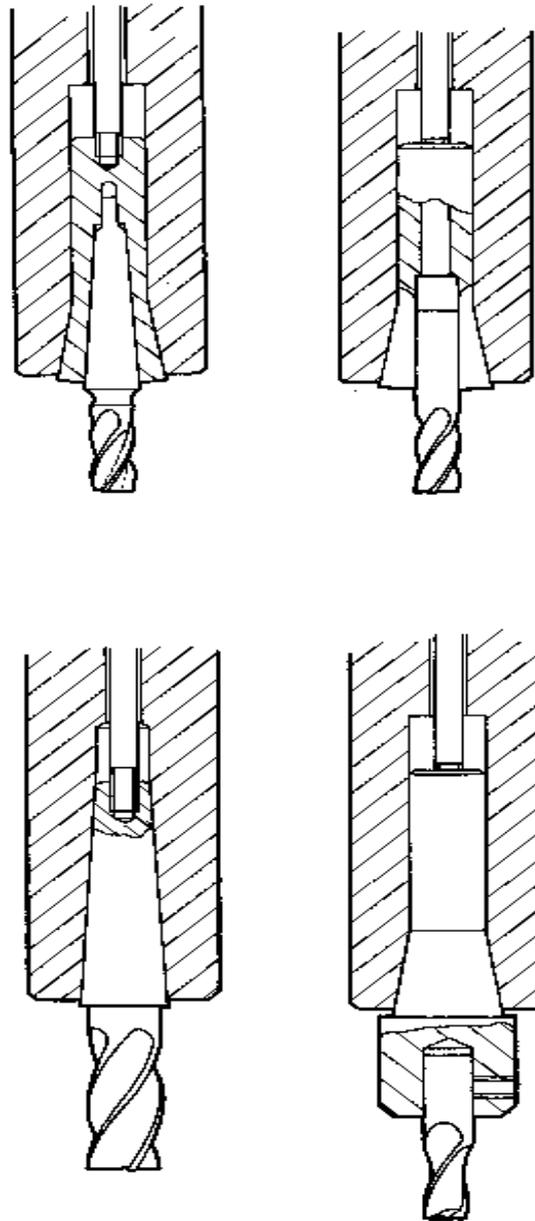
S.No.	Facilities/Material required	Quantity
1.	Horizontal miller	1
2.	Dividing head	1
3.	7/8" Arbor	1
4.	12 Pitch No.5 in volute gear cutter	1
5.	Spacing collars	1

b. Procedure for doing the exercise:

Steps	
1.	Mount the gear blank in the chuck on the dividing head.
2.	Set the work to the cutter.
3.	Take the first cut on the gear.
4.	Finish cutting the teeth.
5.	File the surfaces of the teeth.

c. Figure



**d. Result:**

Thus the bevel gear has make in a milling machine.

Viva questions:**1. What are the main components in milling machine?**

Base, column, knee, saddle, table.

2. Write any six specifications in milling machine?

The table length and width, power of driving motor, spindle nose taper size, type of milling machine, floor space and net weight.

3. What are the types of milling machine?

Plain milling machine, vertical milling machine, universal milling machine, simplex milling machine, triplex milling machine.

4. What are the types of milling cutter?

Plain milling cutter, slide milling cutter, arbor cutters, shank cutters, face cutters.

5. What is the purpose of indexing head?

The work piece held between centre of head stock and tail stock. Short work pieces are held in chuck fitted to head stock spindle.

Experiment Number: 11

Title of the exercise : Straddle milling

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To perform straddle milling in milling machine.

FACILITIES REQUIRED AND PROCEDURE

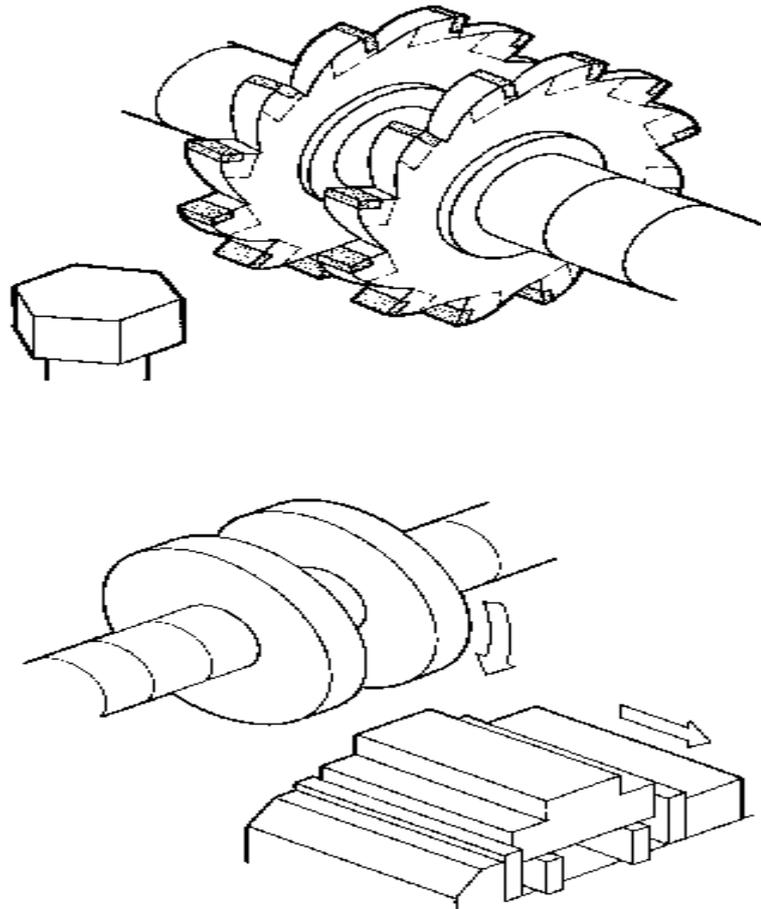
a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	Horizontal miller	1
2.	Dividing head	1
3.	7/8" Arbor	1
4.	12 Pitch No.5 in volute gear cutter	1
5.	Spacing collars	1

b. Procedure for doing the exercise:

Steps	
1.	Mount the gear blank in the chuck on the dividing head.
2.	Set the work to the cutter.
3.	Take the first cut on the gear.
4.	Finish cutting the teeth.
5.	File the surfaces of the teeth.

c. Figure



Straddle Milling on Flatwork

d. Result:

Thus the straddle milling was performed in a milling machine.

Viva questions:**1. What are the main components in milling machine?**

Base, column, knee, saddle, table.

2. Write any six specifications in milling machine?

The table length and width, power of driving motor, spindle nose taper size, type of milling machine, floor space and net weight.

3. What are the types of milling machine?

Plain milling machine, vertical milling machine, universal milling machine, simplex milling machine, triplex milling machine.

4. What are the types of milling cutter?

Plain milling cutter, slide milling cutter, arbor cutters, shank cutters, face cutters.

5. What is the purpose of indexing head?

The work piece held between centre of head stock and tail stock. Short work pieces are held in chuck fitted to head stock spindle.

Experiment Number: 12

Title of the exercise : Machine a cast iron bevel gear

Date of the exercise :

OBJECTIVE OF THE EXEPERIMENT

To machine a cast iron bevel gear in milling machine.

FACILITIES REQUIRED AND PROCEDURE

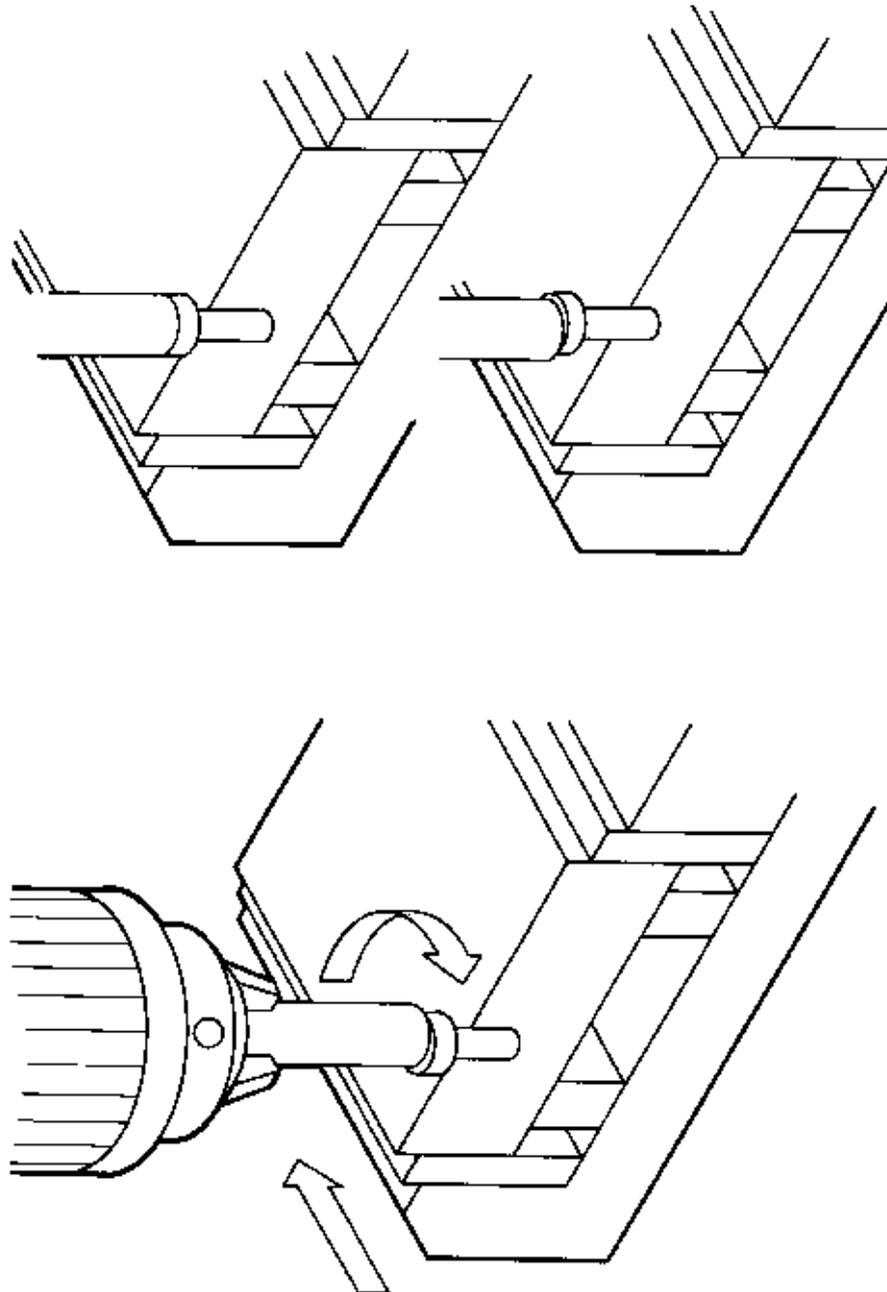
a. Facilities/material required to do the exercise:

S.No.	Facilities/Material required	Quantity
1.	Horizontal miller	1
2.	Dividing head	1
3.	7/8" Arbor	1
4.	12 Pitch No.5 in volute gear cutter	1
5.	Spacing collars	1

b. Procedure for doing the exercise:

Steps	
1.	Mount the gear blank in the chuck on the dividing head.
2.	Set the work to the cutter.
3.	Take the first cut on the gear.
4.	Finish cutting the teeth.
5.	File the surfaces of the teeth.

c. Figure



d. Result:

Thus the cast iron bevel gear is performed in a milling machine.

Viva questions:**1. What are the main components in milling machine?**

Base, column, knee, saddle, table.

2. Write any six specifications in milling machine?

The table length and width, power of driving motor, spindle nose taper size, type of milling machine, floor space and net weight.

3. What are the types of milling machine?

Plain milling machine, vertical milling machine, universal milling machine, simplex milling machine, triplex milling machine.

4. What are the types of milling cutter?

Plain milling cutter, slide milling cutter, arbor cutters, shank cutters, face cutters.

5. What is the purpose of indexing head?

The work piece held between centre of head stock and tail stock. Short work pieces are held in chuck fitted to head stock spindle.

Question Bank

1. Making square from round rod using Shaper.
2. Drilling, Tapping & Counter sinking in radial drilling machine.
3. Making dovetail from round rod using shaper.
4. Making external key way cutting using slotter.
5. Making spur gear using milling machine.
6. Machining for press fit.
7. Grinding to the required accuracy by surface grinding.
8. Grinding to the required accuracy by cylindrical grinding.

Machining for clearance fit.

9.

Beyond the syllabus

10. Making bevel gear
11. Straddle milling
12. Machine a cast iron bevel gear