

**ANNAI MATHAMMAL SHEELA ENGINEERING COLLEGE, NAMAKKAL**  
**DEPARTMENT OF MECHANICAL ENGINEERING**  
**DESIGN OF JIGS , FIXTURES AND PRESS TOOLS**

**UNIT - 1 LOCATING AND CLAMPING PRINCIPLES**

**PART- A**

1. Define the term Tool design.

Tool design is the process of designing and developing the tools, methods, and techniques necessary to improve manufacturing efficiency and productivity.

2. Name the various operations that can be performed using Jig and Fixture.

Jig is usually lighter in construction. Jigs are used on drilling, reaming, tapping and counter boring operation.

3. How are the supporting/loading surfaces made?

Loading and supporting surface usually made of hardened material and also it should be renewable wherever possible.

4. What are production devices?

Production devices are generally work holding devices such as work holders with/without tool guiding/setting arrangement. These are generally called as jigs and fixture

5. Define jig.

A jig may be defined as a work holding device which locates and holds the component for specific operation. It is also provided with tool guiding elements.

6. What are inspection devices?

Inspection devices are used to check the accuracy of the machined components. It facilitates the interchangeability and uniformity of the produced components.

7. State the purpose of jigs and fixtures.

Jigs and fixtures are the devices which are designed for holding, supporting and locating the work piece and to guide the tools.

8. State the use of jigs and fixtures.

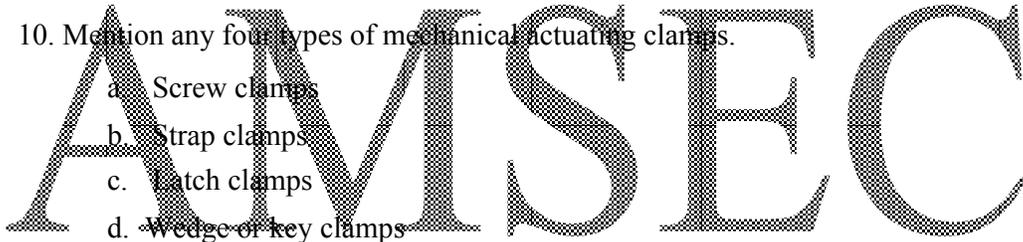
These devices are used to produce a repetitive type of work piece with “zero defects”. But these are economical in mass production only. Jigs and fixtures are designed to save production time, to maintain dimensional accuracy, to facilitate quick and interchangeable assembly.

9. Classify the clamping devices

- a. Mechanical actuating clamps
- b. Power clamps

10. Mention any four types of mechanical actuating clamps.

- a. Screw clamps
- b. Strap clamps
- c. Latch clamps
- d. Wedge or key clamps



11. Define stack clamping.

It is also called as a heel clamping. It consists of a robust plate or strap, centre stud and a heel pin. When the clamping nut is unscrewed, the clamp will be automatically pushed upwards by the spring to make the work piece free. Then the clamp is rotated in anti clockwise direction and the work piece is removed

12. List out some of the power clamping.

- a. Hydraulic clamps
- b. Pneumatic clamps
- c. clamps

13. What is the primary function of a linear bushing/

These bushes are used to guide both renewable and slip bushes and sometimes they also used as a guide to tools.

14. List the standard parts used in jigs and fixtures fabrication.

- a. Bases
- b. Rest buttons
- c. Ping
- d. Feet
  
- f. Drill bushes
- g. Threaded fasteners
- h. Clamps and pressure feet

15. Name some materials commonly used in jigs and fixtures.

- a. High speed steel
- b. Die steel
- c. Carbon steel
- d. Collect steel
- e. Oil Hardening Non-shrinking tool steel
- f. Cast iron
- g. Nylon or fiber
- h. High tensile steel



16. What are the advantages of conical locator ?

Conical locator are preferred over the cylindrical locators where it is necessary to accommodate variation in the hole diameters of the work piece without affecting the accuracy in location .

17. Mention the locating methods.

- a. Pin and Button locators
- b. V-Locators
- c. Bush locators
- d. Nest or Cavity locators

18. What are the essential features of jigs?

- a. Reduction of idle time
- b. Cleanliness

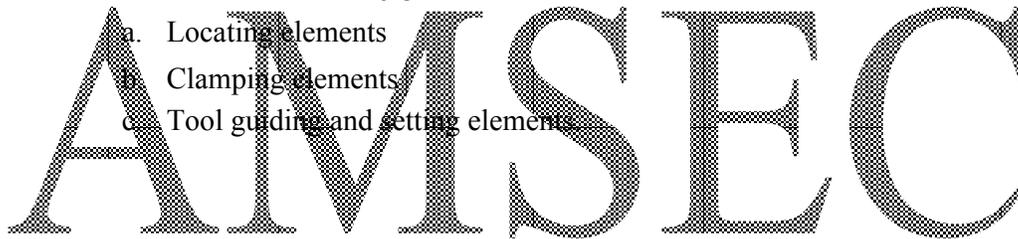
- c. Provision for coolant
- d. Hardened surface
- e. Fool proofing
- f. Position of clamps
- g. Rigidity and stability
- h. Safety

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19. What is meant by 3-2-1 principle of location?

According to this principle, a work piece can be completely restrained by providing three location points in one plane, two location points in the second plane and one location point in the third plane. Therefore it is called 3-2-1 principle of location.

20. What are the elements of jigs and fixtures?



## UNIT - 2 JIGS AND FIXTURES

### PART- A

1. What is the function of jig bushes?

Drill bushes are used to guide drills, reamers and other cutting tools into the proper position on the work piece.

2. What are the two types of press fit bushes?

- a. Plain or headless bushes
- b. Flanged or headed bushes

3. Distinguish between channel and box jigs.

In channel jigs, holes are drilled only in face but holes can be drilled on more than face using box jigs.

4. What are the different types of jigs?

- a. Plate jigs
- b. Latch jig
- c. Channel jig

5. Define sandwich jig.

These jigs are a form of plate jig with a back plate. This type of jig is ideal for thin or soft parts that could bend or warp in another style of jig. Here again, the use of buildings is determined by the number of parts to be made.

6. What are the standard work holding devices in lathe?

- a. Chucks
- b. Collets
- c. Face plate

7. Mention any four essential features made on milling fixtures

- a. Base
- b. Tendon strips
- c. Setting block
- d. Locating elements

8. List out the various locators used in fixtures.

- a. Cylindrical locating pin
- b. Diamond pin locator
- c. Screw and dowels

9. What devices are mainly used to assemble modular elements?

Modular fixturing is a work holding system which uses a series of reusable standard components to build a wide variety of special purpose work holding devices. These types of fixtures are assembled with a variety of standard tooling plates, supports, locating elements, clamping devices and similar units.

10. What are the important elements of inspection fixtures?

- a. Locating element
- b. Clamping element

- c. Gauging element
- d. Auxiliary element

11. What are the two types of inspection fixtures?

- a. In-process inspection fixtures
- b. Off-line inspection fixtures

12. State the use of grinding fixtures.

Several different forms of fixtures are used on grinding machines to locate, hold and support the work piece during the operations.

13. What are boring fixtures? How do you classify them?

This fixture which is used for cutting internal key-ways in pulleys, gears, sprockets, etc is known as key way broaching fixture

15. What are the various machine tools used for boring?

- a. Lathes
- b. Drill presses
- c. Milling machine
- d. Jig boring machine
- e. Vertical or horizontal boring mills

16. State the classification of boring bars.

- a. Stub bar
- b. Single-piloted bar
- c. Double-piloted bar

17. What are the different types of broaching operation?

- a. Keyway broaching
- b. Hole broaching
- c. Gear broaching

18. What are fixtures?

Some type of tooling used in positioning parts relative to each other for

fabricating purposes are commonly referred to as fixtures.

19. When slip bushes are used?

Slip bushes are mainly used when a hole in the work piece requires two operations. Ex: performing both drilling and reaming in a same jig plate.

20. What is the use of tack welding fixture?

Tack welding fixtures are used to locate the components of an element in their correct relationship with proper clamps while a welder tacks them together prior to their final welding.

### UNIT - 3 PRESS WORKING TERMINOLOGIES

#### AND ELEMENT OF CUTTING DIES

#### PART- A

1. How is cutting operation carried out?

The work piece is stressed beyond its ultimate strength and cut-off into two pieces.

2. List out the various cutting operations.

- a. Blanking
- b. Shearing
- c. Parting off

3. Mention the three different ways of working sheet metal in presses.

- a. Shearing
- b. Bending
- c. Drawing

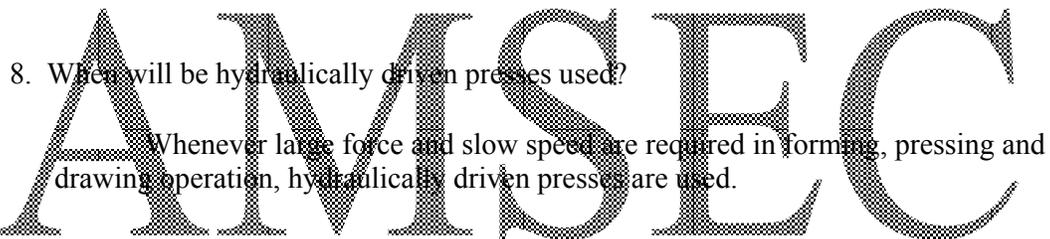
4. Classify sheet metal operations

- a. Cutting operations
- b. Forming operations

5. State the advantages of press working operations.
  - a. Material economy
  - b. High productivity
  - c. Uniformity of parts
  
6. What are the applications of press working operations?
  - a. Electronic appliances
  - b. Steel furniture
  - c. Coach building
  
7. Name some types of forming operations.
  - a. Bending
  - b. Drawing
  - c. Squeezing
  - d. Embossing

8. When will be hydraulically driven presses used?

Whenever large force and slow speed are required in forming, pressing and drawing operation, hydraulically driven presses are used.



9. How will you select the proper material for press tools?
  - a. Hardness
  - b. Compressive strength
  - c. Toughness
  
10. What factors are considered for selecting an appropriate press for a given job?
  - a. Force required to be cut the metal
  - b. Die space
  - c. Size and type of die
  - d. Stroke length
  - e. Shut height
  - f. Type of operation

11. List down the material used for press working operations.

- a. Mild steel
- b. Stainless steel
- c. Brass
- d. Copper
- e. Aluminum

12. What is a progressive die? When should a progressive die be used?

A die which is used to perform two or more operations at different stages every time when the ram descends is called progressive die. It is mainly used where the accuracy of the products is maintained.

13. Explain the function of bolster plate in press tool.

The bolster plate is the thick plate mounted on the base. It is used for locating and supporting the die assembly. It is usually 5 to 12.5 mm thick plate.

14. What are the methods of holding pilots?

- a. Direct pilots
- b. Indirect pilots

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15. What are the types of stock stop?

- a. Lever or latch type
- b. Automatic stop
- c. Shoulder stop
- d. Starting stop

16. State the function of a knockout.

The function of knockout is to eject or remove the work piece from within the die cavity as the work piece may adhere in the die cavity due to friction.

17. What is the purpose of pilot?

Pilot is a locating pin chamfered on the front end to facilitate fitting and entering the work piece.

18. List down the various methods of arranging guide pins in the die set.

- a. Back-post design
- b. Centre-post design
- c. Diagonal-post design
- d. Four-guide post design

19. What are the types of die set?

- a. Precision die set
- b. Commercial die set

## UNIT - 4 BENDING, FORMING AND DRAWING DIES

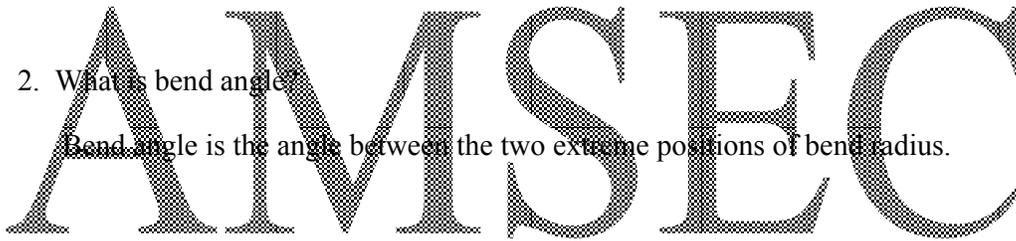
### PART- A

1. Define neutral axis?

The axis which separates the portions of tension and compression is known as “Neutral axis” or “Neutral layer”.

2. What is bend angle?

Bend angle is the angle between the two extreme positions of bend radius.



3. List down the types of bending dies?

- Edge bending
- V - Bending

4. What is spring back in bending?

The tendency of the metal tries to resume its original position causing a decrease in bend angle known as spring back,

5. What does spring back cause in bending?

Spring back is caused by a larger bend radius.

6. What does meant by bending allowance?

It is also called spring back allowance. Spring back allowance is defined as the tendency of sheet metal to change the shape from final shape.

7. What is meant by coining?

The process of pressing the metal in a die to allow the metal to flow into the space on the die face is known as coining.

8. Mention the application of coining process.

- Metal buttons
- Table wares
- Jewellery

10. What are the advantages of coining process?

- Excellent surface finish can be obtained.
- More close tolerances can be achieved.

11. Define deep drawing?

Deep drawing is the manufacturing process of forming sheet metal stock, called blanks, into geometrical or irregular shapes which are more than half their diameter in depth.

12. Define redrawing process.

The process of deepening the cup after the first draw is known as redrawing.

13. What is meant ironing?

The process of reducing wall thickness and lengthening of the cup is known as ironing.

14. List down the type of drawing dies?

- Single action dies
- Double action dies

15. What are the methods of holding pilots?

- Direct pilots
- Indirect pilots

16. Classify indirect pilots.

- Acorn type or spherical type.
- Flatted end type.

17. Define ductility.

Ductility is the ability of the material to undergo a change in shape without fracture.

18. How can we fine drawings speed?

Drawing speed is refined as the velocity at which the punch travels into the drawing die during the drawing process.

19. What is the purpose of stock-stop?

It is used to stop the die at a required distance. It avoids over penetration of die in a materials.

20. What are draw die inserts?

Draw die inserts are small tooling segments attached to form a shape during drawing operations.

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**UNIT - 5 DESIGN OF MOULDS**  
**PART - A**

1. What is plastic processing?

Plastic Processing is one of the fastest growing segments of manufacturing plastic processing is a form conversion process

2. Define injection molding. Injection molding is a process of producing parts form thermoplastics And thermo plastics.

3. State the two units of a ram type of injection moulding process

- Injection Unit
- Clamping Unit

4. What is the use of rotational moulding?

The rotational moulding process is used to take thin walled hollow parts.

5. Define cycle time

The time interval covering the mould cycle is known as cycle time.

6. What is the press tonnage of compression moulding?

The press tonnage requirement may range from 100-500 tones.

7. What is called positive mould?

When the plastic is completely trapped between the male and female dies, it is called as positive mould

8. What are the main advantages of thermoforming?

The main advantage of this process is low cost and quick process of making the sheet

9. Classify extrusion die.

Die for solid section

Die for hollow section

10. State common impregnation liquids

Epoxy

Polyurethane

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11. What are the elements considered for the construction of an injection moulding?

Fixed half and moving half

Cavity

Core

Impression

Spur bush

Runner

Gate systems

Guide pillars and bushes

12. Mention the function of runner.

Runner is the primary channel carrying the plastic melt from sprue to the gate systems in multiple cavities in a mould

13. What do gate systems do?

Gate is the secondary channel carrying plastic melt from runner to the mould cavity.

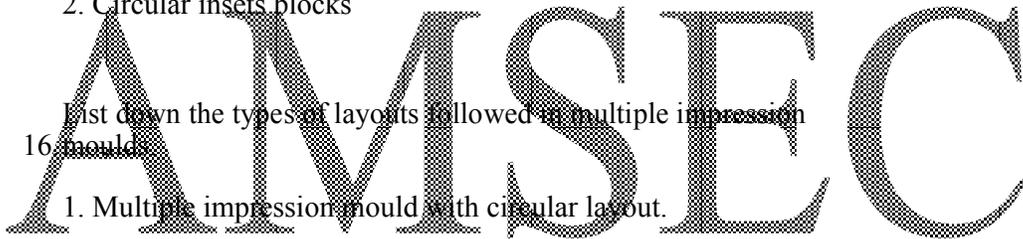
14. Classify cavity and core

1. Integer cavity and core plates
2. Cavity and core inserts

15. What are the types of cavity and core inserts?

1. Rectangular insets blocks
2. Circular insets blocks

16. List down the types of layouts followed in multiple impression moulds.



1. Multiple impression mould with circular layout.
2. Multiple impression mould with rectangular layout.

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17. What is a bolster?

Bolster is the steel plate on which the cavity or core inserts are mounted. It is normally made up of mild steel.

18. Mention the types of bolsters.

1. Solid bolster
2. Strip type bolster
3. Frame type bolster
4. Chase type bolster

19. What is gate in injection moulding?

Gate is the channel or orifice connecting the runner with the impression

20. List down the advantages of ejector pin.

1. Service life is more.
2. It is easy to repair

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