A Laboratory

Manual

For

MECHANICAL ENGINEERING DRAWING (PR- 1)

In accordance to syllabus

By S.C.T.E & V.T, Odisha

Semester – 3rd

DEPARTMENT OF MECHANICAL ENGINEERING

GOVERNMENT POLYTECHNIC, MAYURBHANJ

ODISHA – 757049

Affiliated to S.C.T.E & V.T, Odisha and A.I.C.T.E,

New Delhi

SYLLABUS

MECHANICAL ENGINEERING DRAWING (PR-1)

Name of the Course: Diploma in **Mech/Auto/Aero & Other Mechanical Allied Branches**			
Course code:		Semester	3rd
Total Period:	90	Examination	3 hrs
Lab Periods:	6 P/week	Sessional:	25
Maximum marks:	75	End Semester Examination:	50

COURSE OBJECTIVES:-

Students will develop ability towards

- Recognizing significance of standardized representations
- Comprehending role of various fastening elements and offer engineering drawing thereof in manual mode
- Comprehending geometrical constraints and function of components in assemblies such as bearings and screw jack
- Comprehending functional requirement of major components and offer engineering drawing in manual mode thereof.

Chapter	Contents
1.0	Revision of Engineering Drawing of 1st Year
2.0	Draw plan, elevation and side view of different machine elements from their isometric view using AutoCAD & mini drafter (Minimum 5 Drawings).
3.0	Engineering drawing of fastening elements in first angle orthographic Projection 3.1 Bolt, nut and threads 3.2 Cotter joint 3.3 Knuckle joint
4.0	Details to assembly 4.1 Rigid pedestal bearing 4.2 Foot step bearing 4.3 Simple Screw jack
5.0	Assembly to details 5.1 Connecting rod of IC Engine 5.2 Boiler safety valve 5.3 Spring loaded valve 5.4 Hydraulic non return valve 5.5 Flat belt pulley

EXPERIMENT– 01

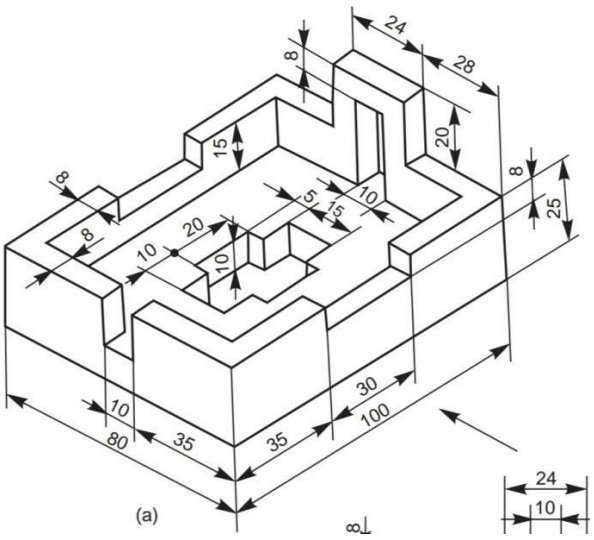
Orthographic Sectional Views

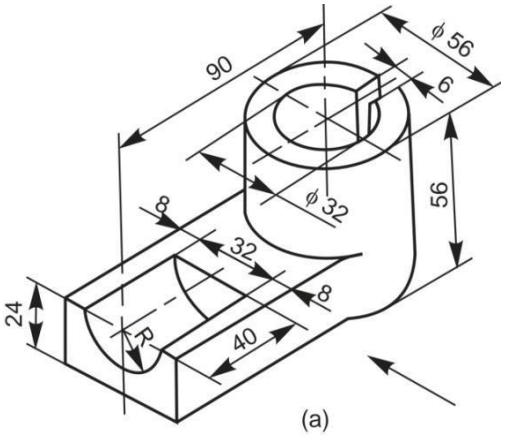
Aim:

To draft the orthographic views with suitable sections.

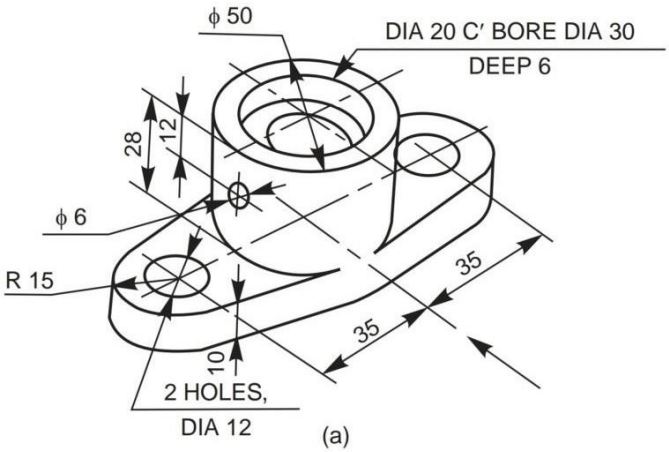
Questions:

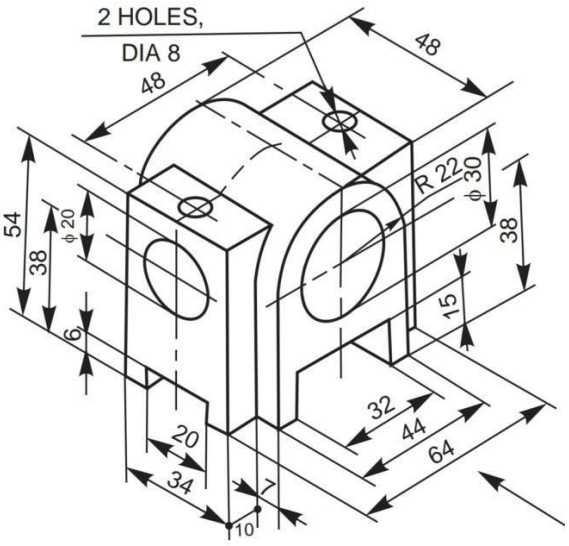
1. Draw the sectional Front view&Left side view along with Top View.





2. Draw the sectional Front&Sectional Left side views along with Top View.





EXPERIMENT– 02

Simple Machine Elements

Aim:

To draft the orthographic views with suitable sections of simple machine parts.

Machine Parts:

Simple Machine Elements.

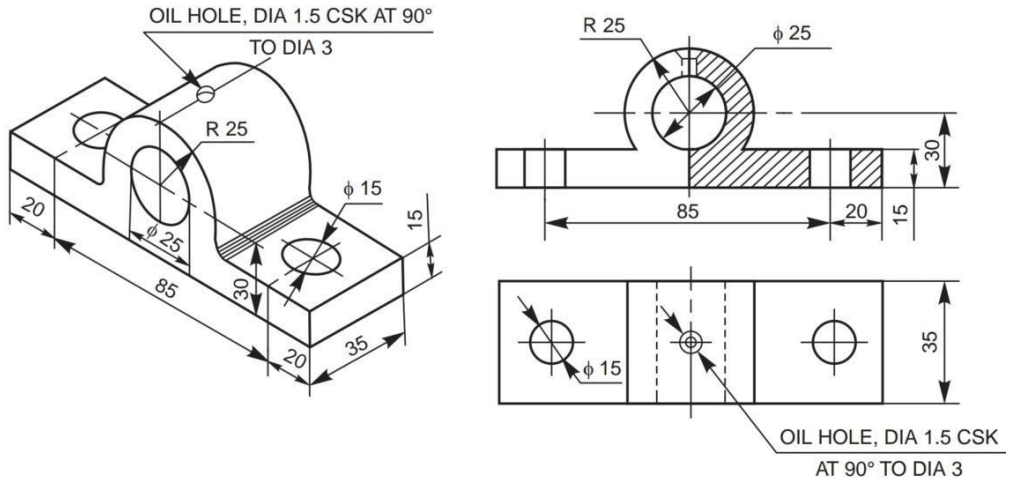


Fig. 12.2 Solid journal bearing

Keys&Cotters

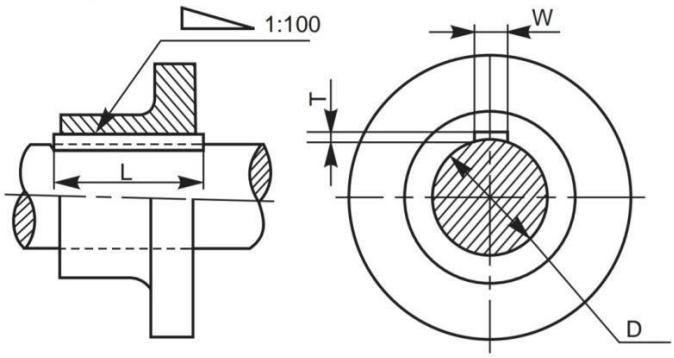


Fig. 6.2 Hollow saddle key

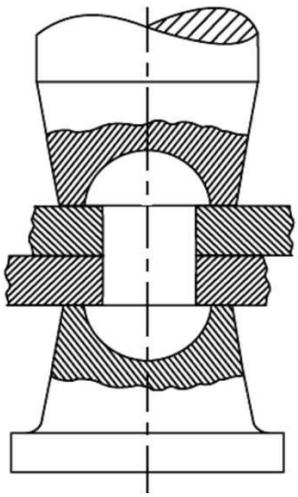
EXPERIMENT– 03

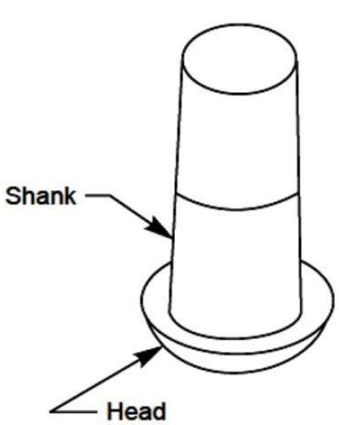
Riveted Fastenings

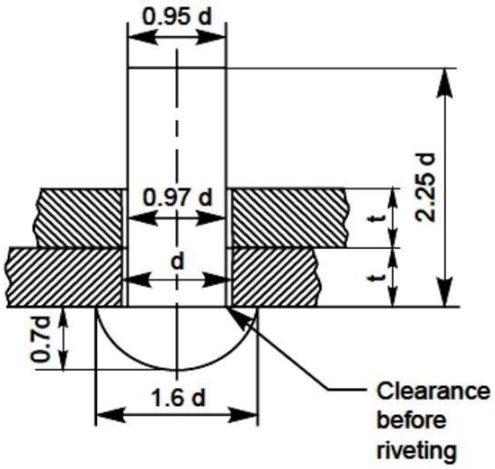
Aim:

To draft the sectional front view& Broken Top view of rivets as per the question.

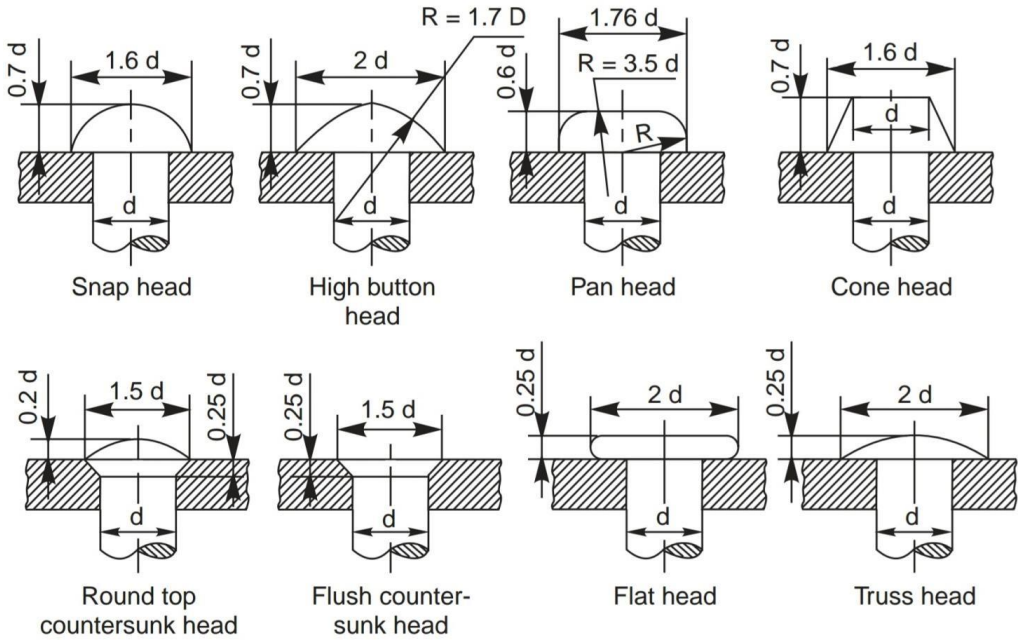
Process of Riveting:







TypesofRivetHeads:

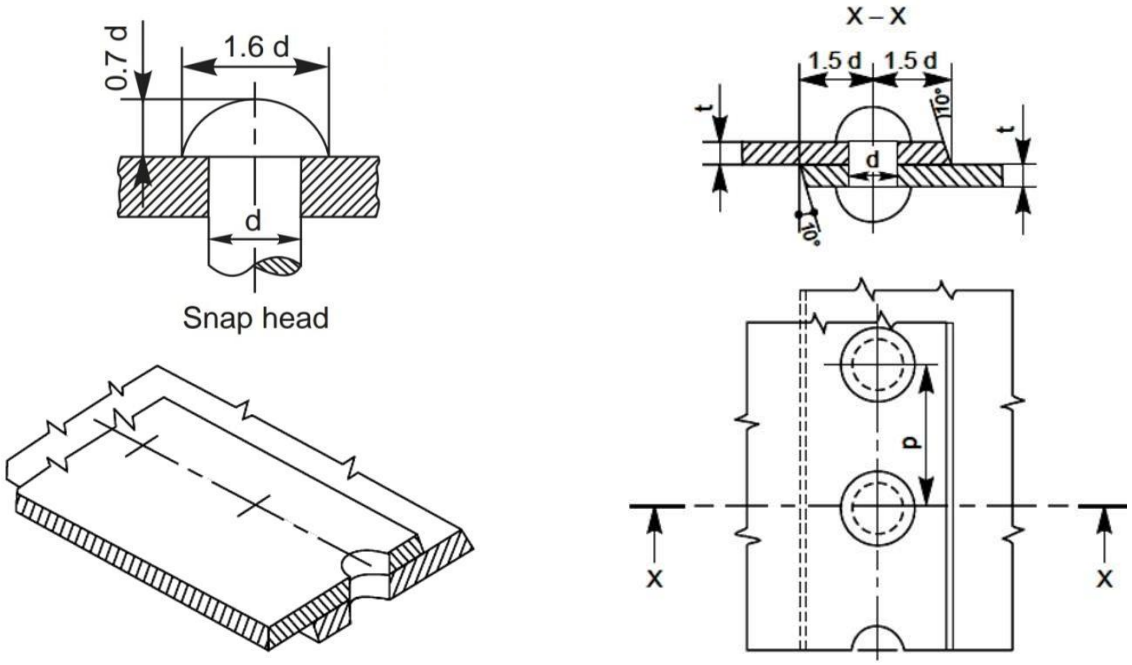


Other important formulae:

t_1=1.125t-thicknessofthesinglestrapplate. t_2=
0.75t-thickness ofthe double strap plate.
P=3d-Distancebetweenadjacentrowsofrivets
P_r= 0.8P (for chain riveting) - distance between adjacent columns of rivets.
P_r=0.6P(forzigzagriveting)-distancebetweenadjacentcolumnsofrivets.

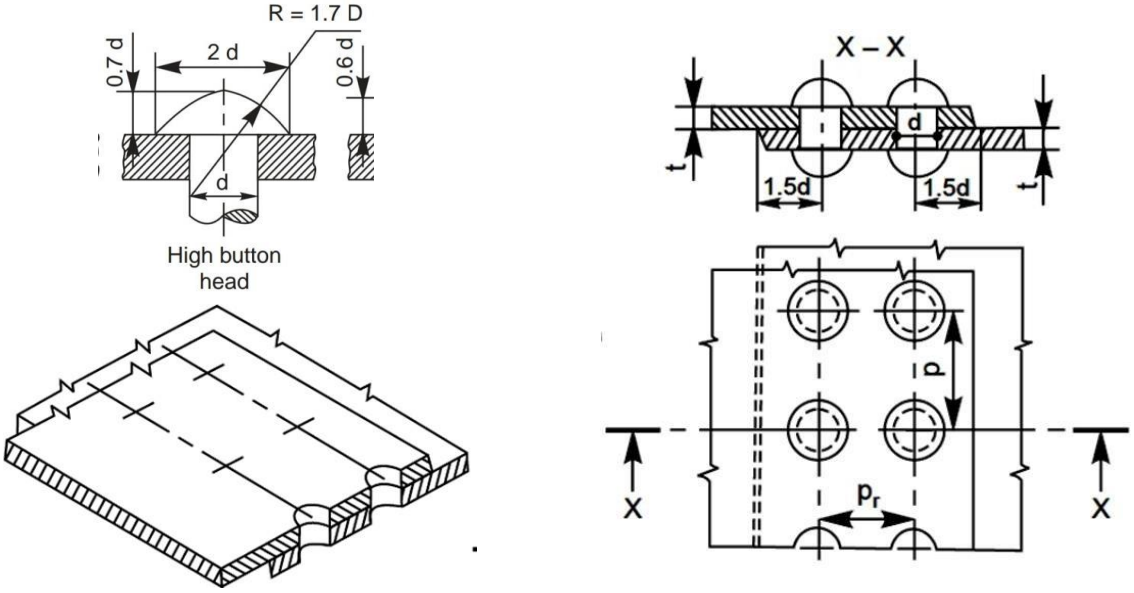
QuestionNo1

Draw sectional front view &broken top view of a **Single riveted lap joint** for sheets of thickness, t=16mm. Use **snap head type** of rivet head.



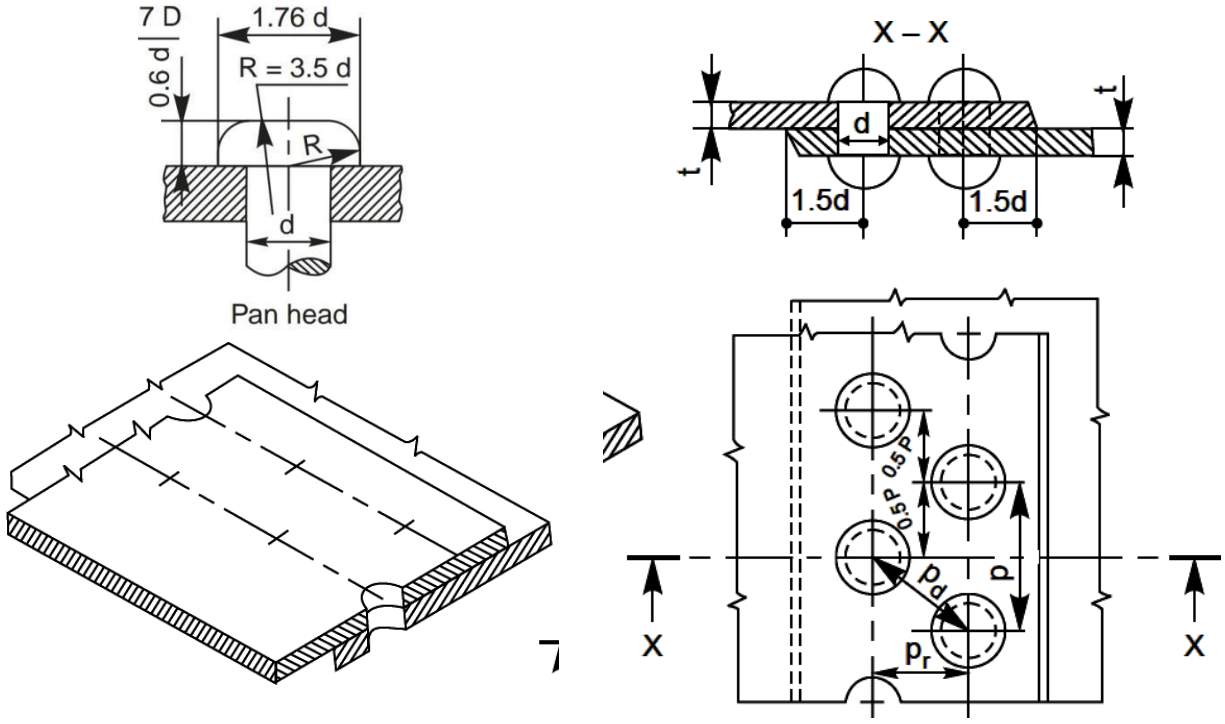
QuestionNo2

Drawsectionalfrontview&brokentopviewofa**Doublerivetedchainlapjoint**forsheetsof thickness, t=12mm. Use high button head type of rivet head.



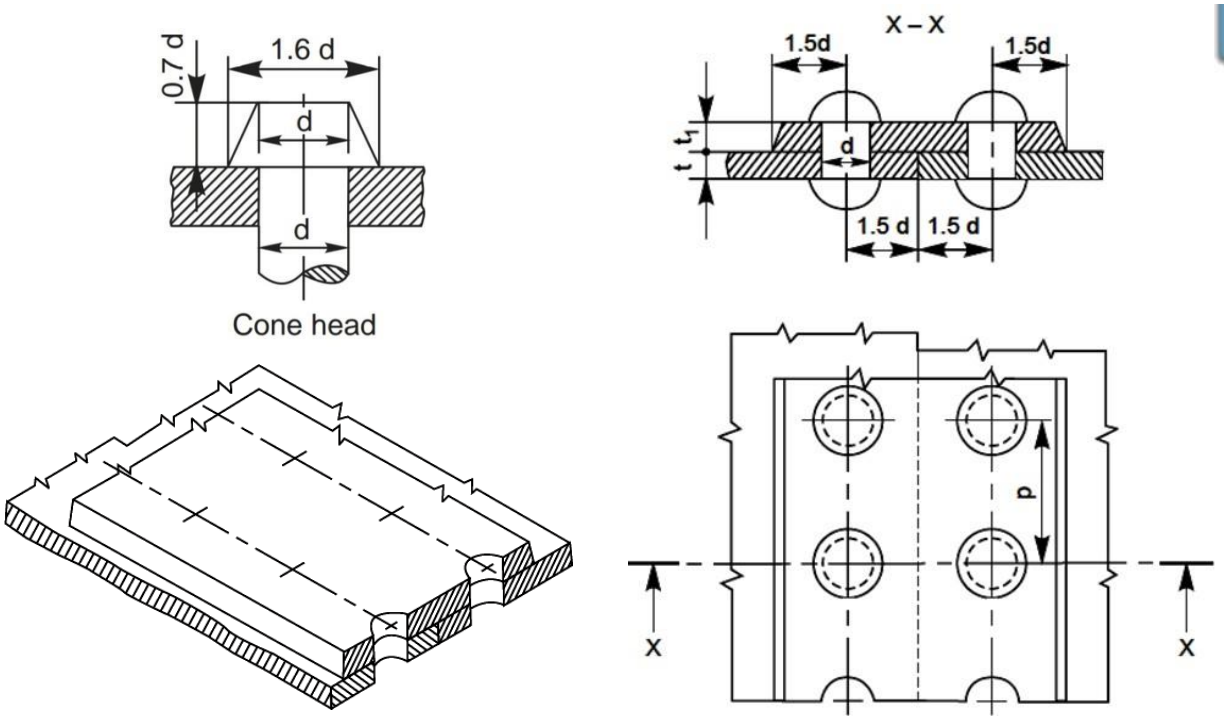
QuestionNo3

Drawsectionalfrontview&brokentopviewofa**Doublerivetedzigzaglapjoint**forsheetsof thickness, t=12mm. Use **Pan Head** type of rivet head.



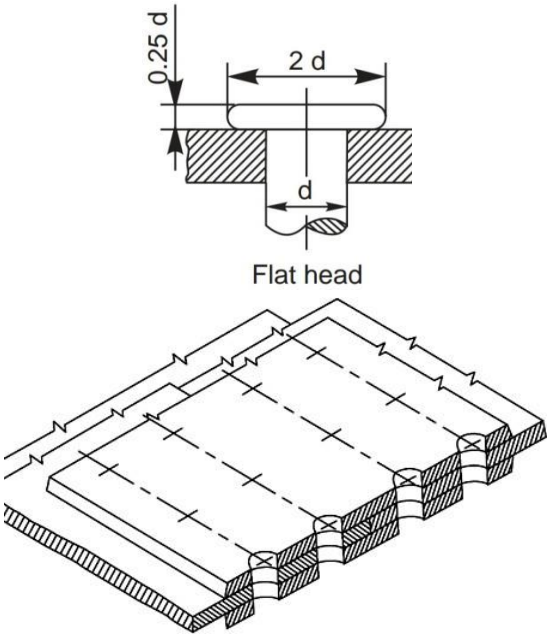
QuestionNo4

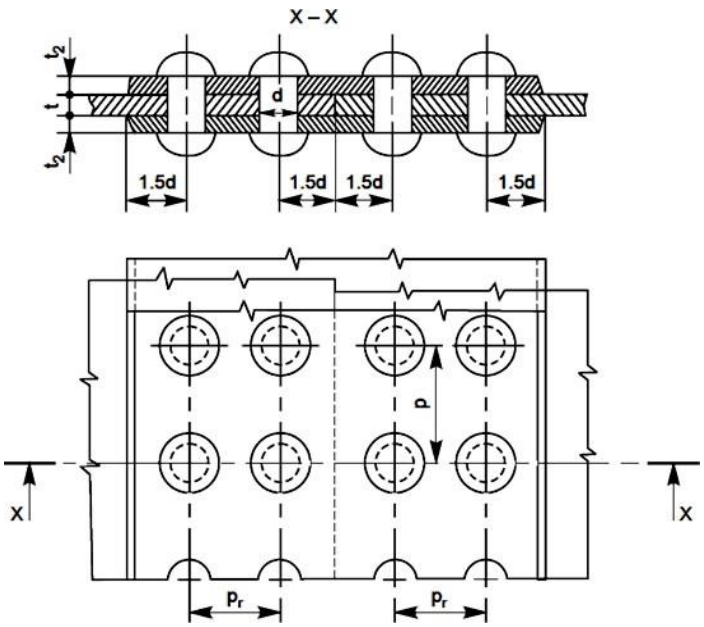
Drawsectionalfrontview&brokentopviewofa**SinglestrappedSinglerivetedbuttjoint**for sheets of thickness, t=12mm. Use **Cone Head** type of rivet head.



QuestionNo5

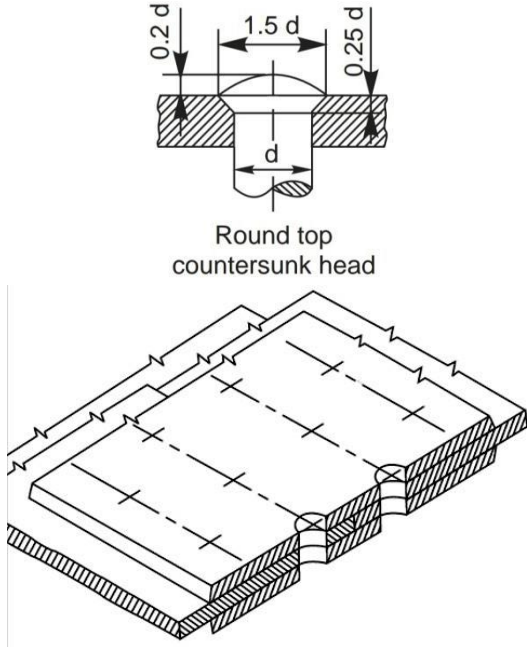
Draw sectional front view&broken top view of a **Single strapped Double riveted chain butt joint** For sheets of thickness, t=9mm.Use **Flat Head** type of rivet head.

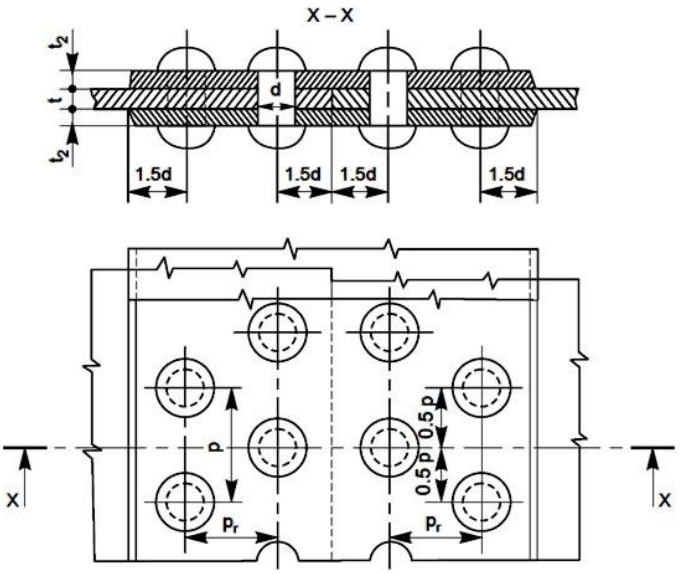




QuestionNo6

Drawsectionalfrontview&brokentopviewofa**Doublestrappeddoublerivetedzigzagbutt joint** for sheets of thickness, t=9mm. Use **Round Top Countersunk** type of rivet head.





EXPERIMENT– 04

Screwed Fastenings

Aim:

To draft the orthographic projections of screwed fastener.

Questions:

1. Draftthenutsgivenbelowusingratiosgiveninthediagramassuming D=20mm.

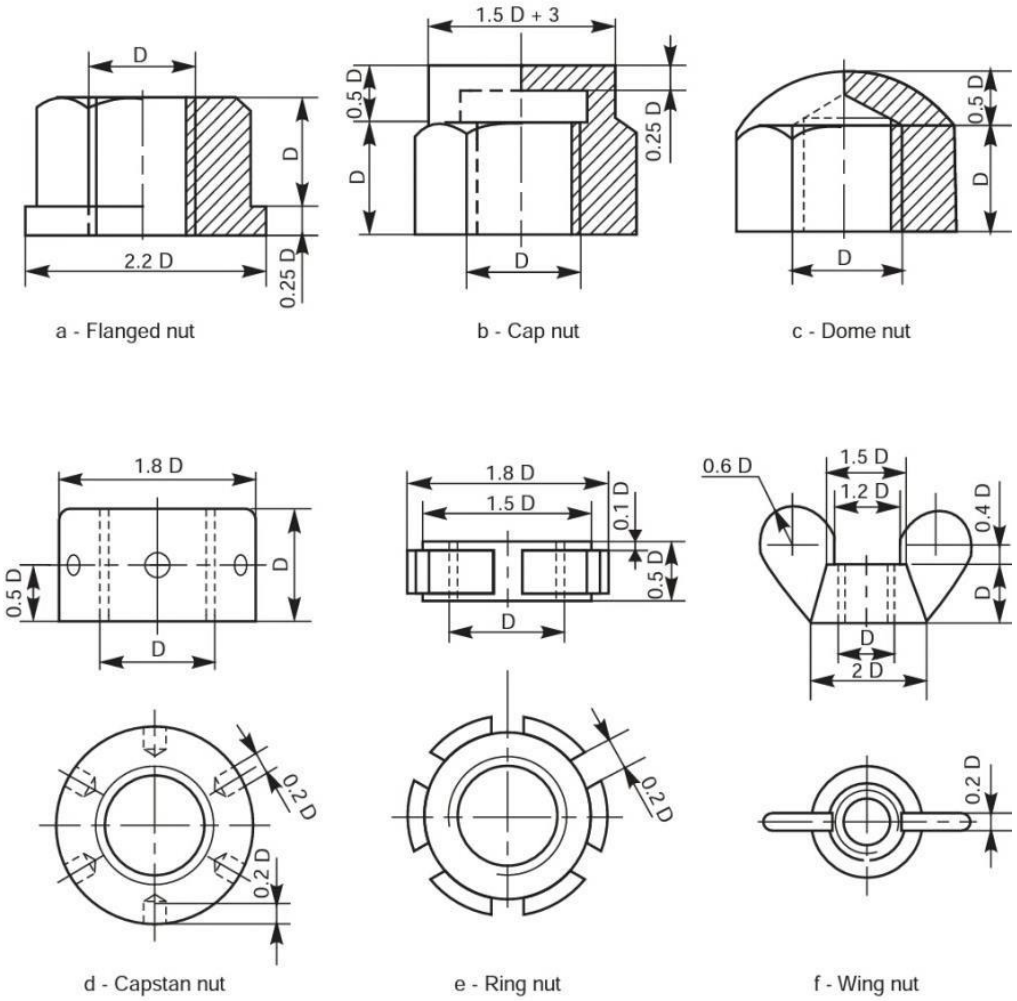


Fig. 5.23 Other forms of nuts

2. Draftthenutsgivenbelowusingratiosgiveninthediagramassuming D=20 mm.

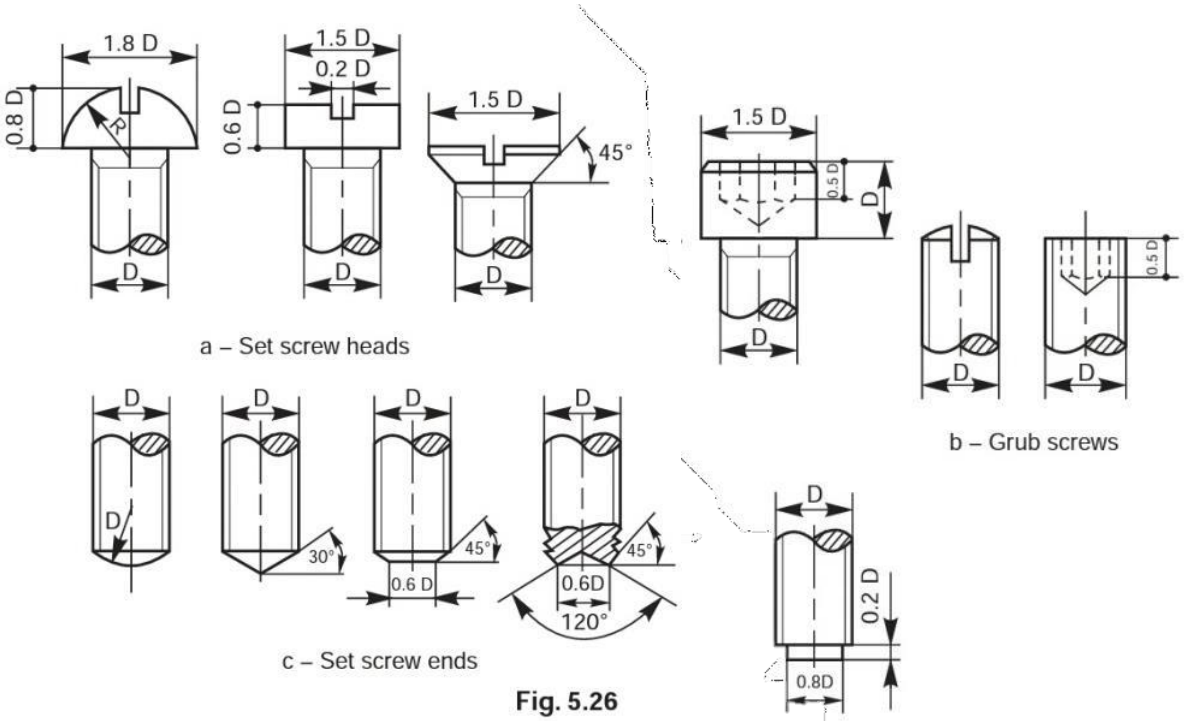


Fig. 5.26

3. Drawthefrontviewtopviewandsideviewofahexagonal boltandnutassembly.

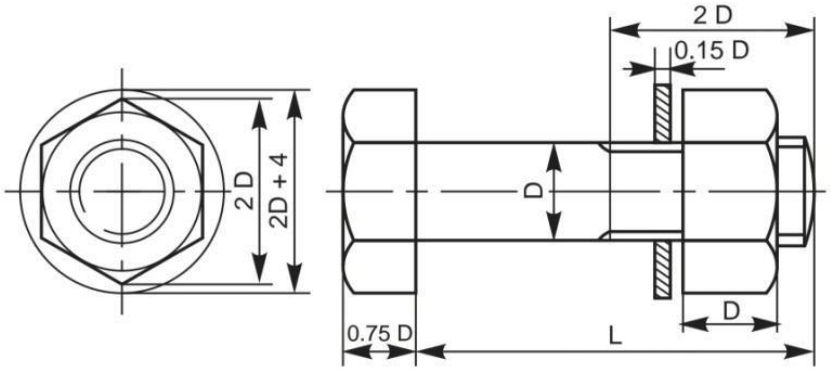


Fig. 5.17 A hexagonal headed bolt with a nut and a washer in position

4. Draw the front view, side view and a top view of a square bolt and nut assembly.

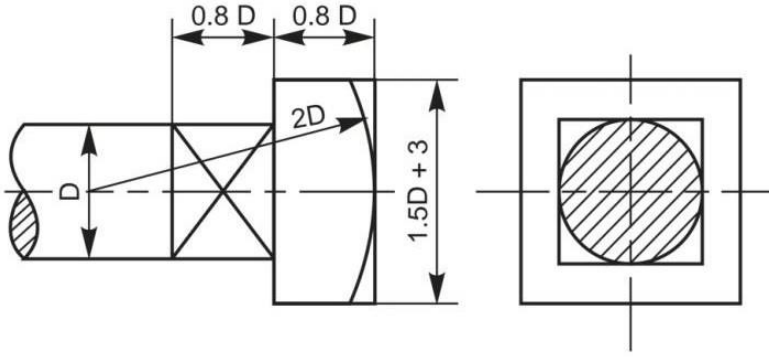


Fig. 5.18 Square headed bolt with square neck

EXPERIMENT– 05

Joints & Couplings

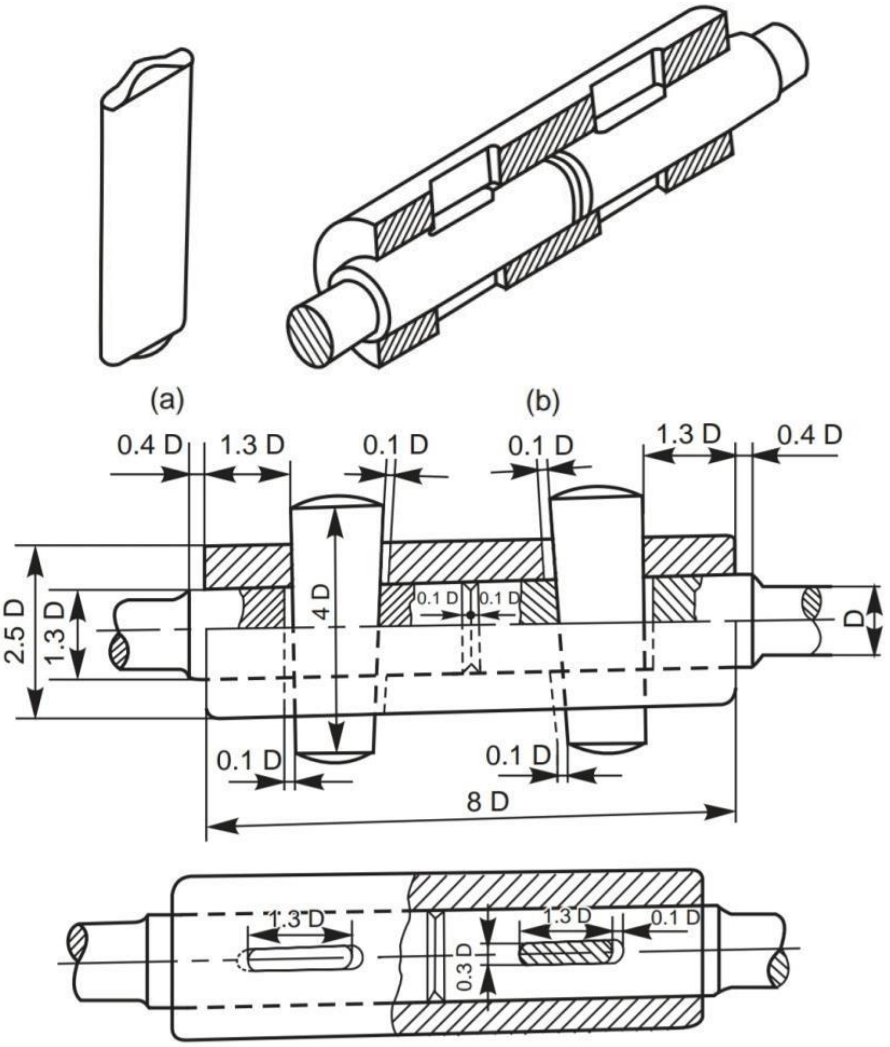
Aim:

Todraftthesuitablysectionedfrontview&sideviewsofthejoints&couplings

Questions:

Double Cottered Joint/Cottered Joint with Sleeve

1. Drawadoublerivetedjointwithdiameterofshaftas**20mm**assumingsuitableratios.



Cotter Joint with Socket Spigot Joint

2. Drawasocketspigotjointforashaftofdiameter**24mm.**Usesuitableratios.

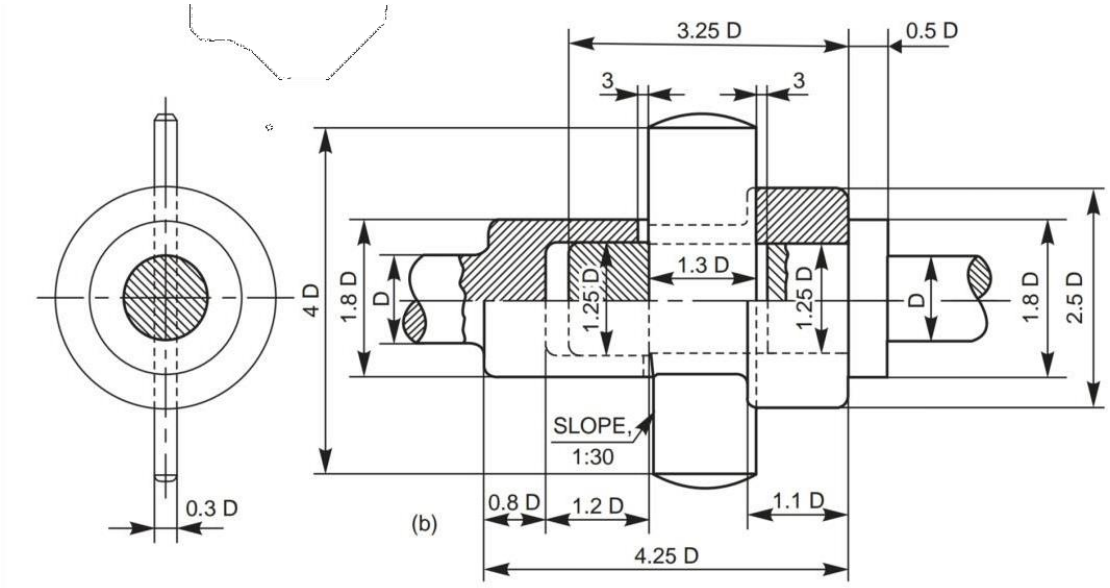
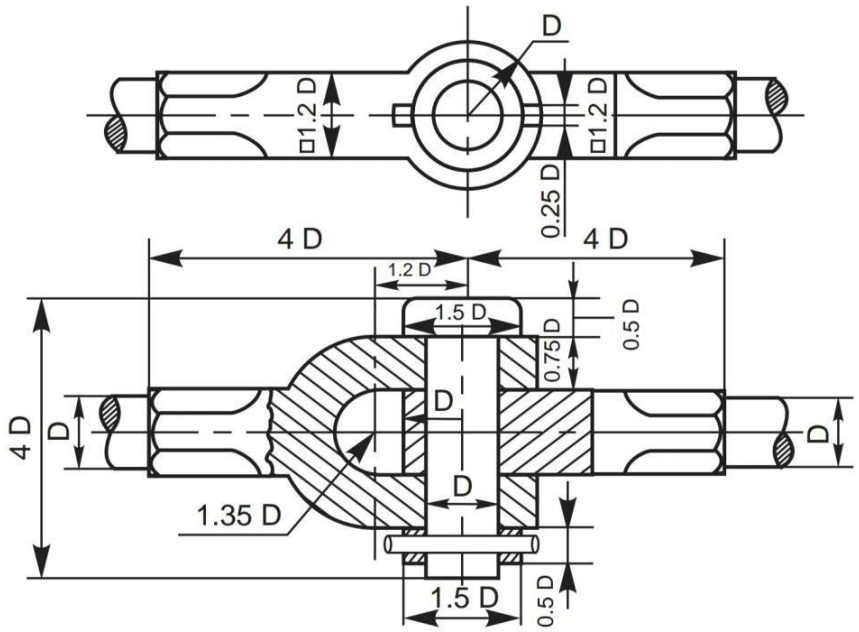


Fig. 6.13 Cotter joint with socket and spigot ends

Knuckle Joint

3. DrawaKnuckleJointforashaftofdiameter20mmusingsuitableratios.



Flanged Coupling

4. DrawaFlangedCouplingforashaftofdiameter20mmusingratiosprovidedinthediagram below:

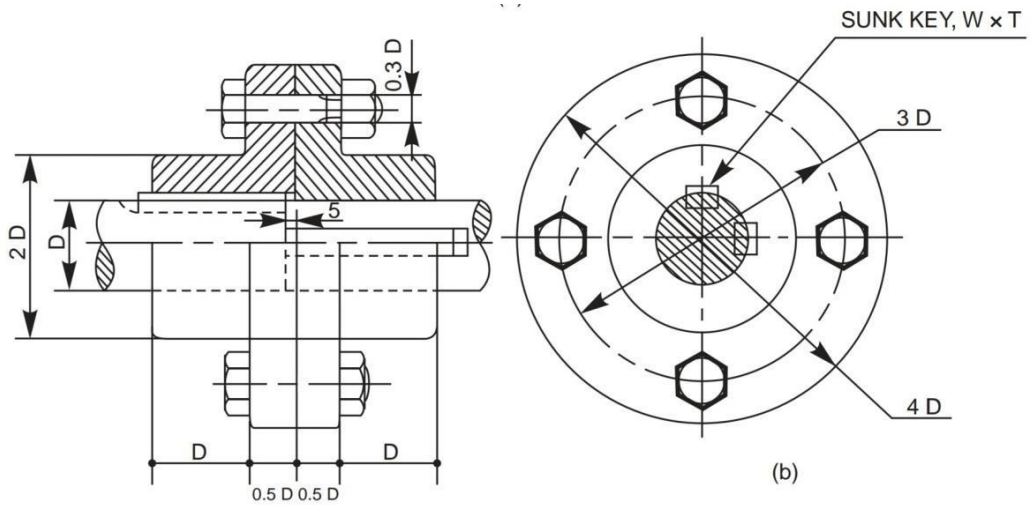


Fig. 7.4 Flanged coupling

ProtectedFlangedCoupling

5. DrawaProtectedFlangedCouplingforashaftofdiameter20mmusingratiosprovidedinthe diagram below:

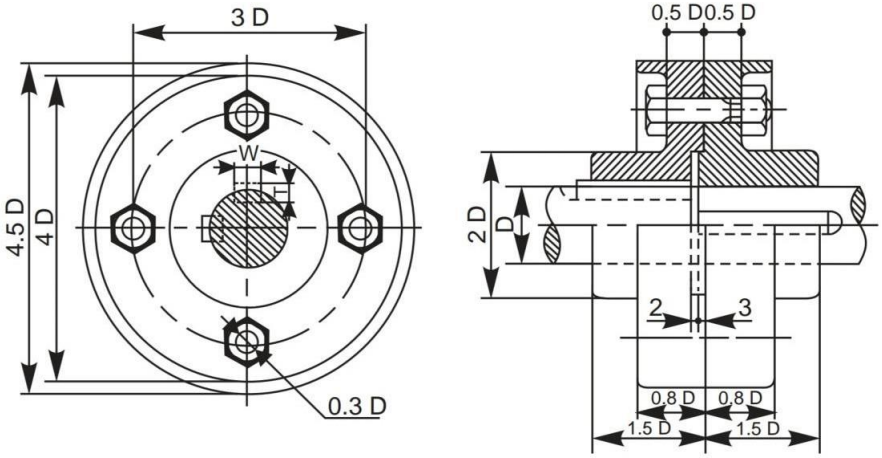


Fig. 7.5 Protected flanged coupling

Bushed Pin Type Flanged Coupling

6. Draw a Bushed Pin Type Flanged Coupling for a shaft of diameter 20mm using ratios provided in the diagram below:

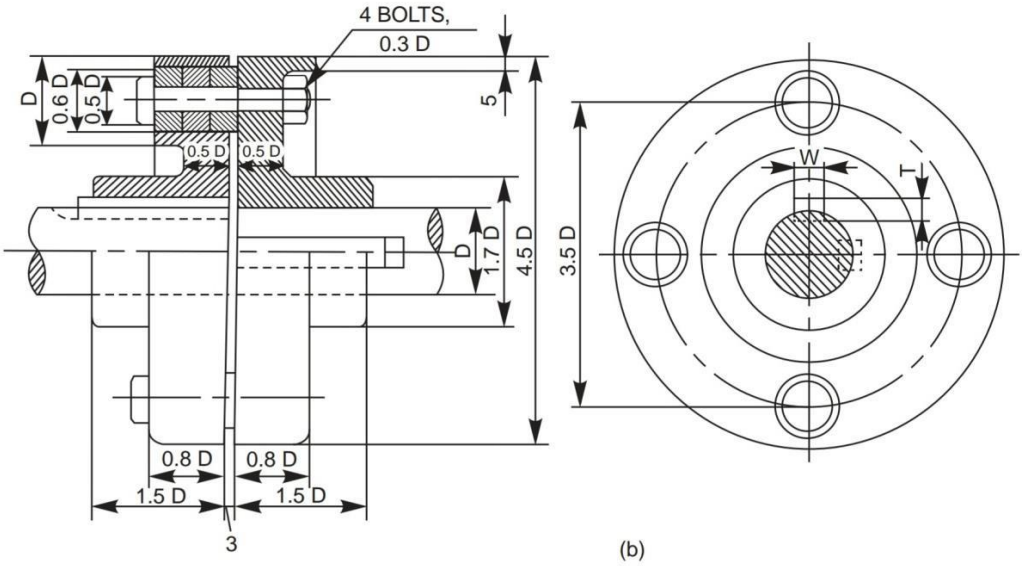


Fig. 7.7 Bushed pin type flanged coupling

EXPERIMENT:06

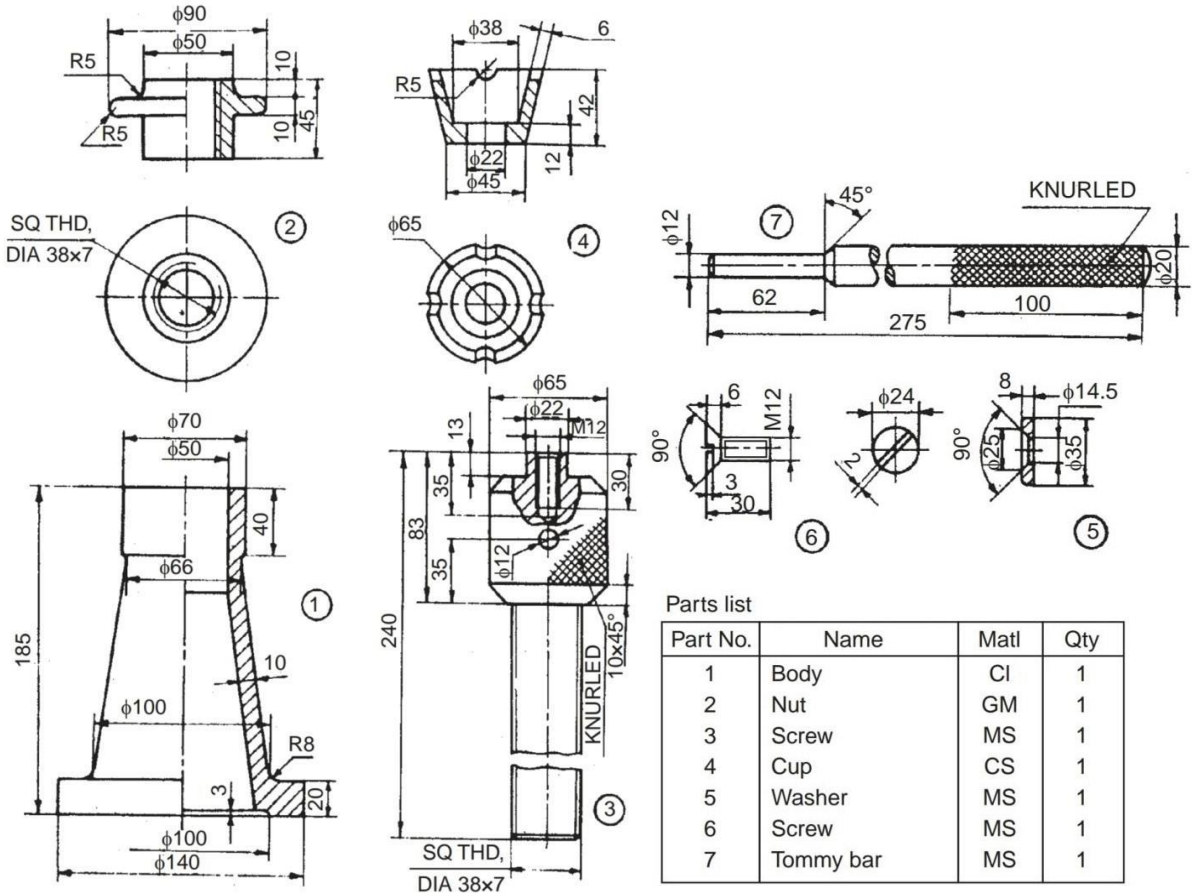
Screw Jack

Aim:

To model the screw Jack assembly from given dimension

Question & Part Details:

1. Complete the following tasks using
   a. Modelallthepartsgivenbelowinpartmodule.
   b. Assembleallthepartsusingassemblymodule.
   c. Generate the half sectional front view, Top View & side view of the assembly using drawing module. Also generate the Bill of Materials & number the parts shown in the assembly using balloons.



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Nut	GM	1
3	Screw	MS	1
4	Cup	CS	1
5	Washer	MS	1
6	Screw	MS	1
7	Tommy bar	MS	1

Procedure:

1. Modelallthepartsgiveninpartsmodule&applymaterialasshowninthepartstable.
2. Assemblythepartssuitablyusingassemblymodule.
3. Drafttheassembly,markpartnumbersusingballoons&takeprintofthesame.
4. Notedownthefollowing values:
    a. Total massofthe assembly= _____
    b. Distance between centre of gravity of each part from its lowermost point when it isplaced vertically? ____

Precautions:

1. Do not save your files on desktop or C drive. (They will be automatically erased on systemrestart.)
2. SaveyourfileintheDdriveinafolderofyournameorroll number.
3. Don'tinstall,uninstallorchangeanysettingthesystem.
4. Don'ttamperorexchangeanyhardware(mouse/keyboardetc)
5. Informaboutanymalfunctionstotheinstructorrightaway.

Viva Questions:

1. WhataretheapplicationsofEccentrics?
2. What type of fitting is used between the following pairs & why?
    a. Body&Nut
    b. Nut& screw
    c. Cup&Screw
    d. TommyBar&Screw
3. WhatisthetotalmassoftheassemblyafterapplyingthematerialsmentionedintheParts Table? _
4. What is the height of centre of gravity of each part from its lowermost point when it is placed vertically? _____

EXPERIMENT:07

Connecting Rod

Aim:

TomodeltheConnectingRodassemblyfromgivendimensionsusingavailableCAD package.

Apparatus:

Hardware:DesktopSystemwithi3processor,8GBRAM,GraphicsCard&250GBHDD.
Software: Windows 7 64-bit OS, _____Package.

Commands/Featuresused(infollowingmodules):

Sketcher:Line,Circle,ConstructionGeometry,Dimensioning,Constraints Part:
Extrude, Revolve, Add, Subtract
Assembly:Axiscoincidence
Drawing:InsertView,InsertProjection,GenerateSectionalView,Dimensioning

Question&PartDetails:

2. CompletethefollowingtasksusingSolidworks,
   a. Modelallthepartsgivenbelowinpartmodule.
   b. Assembleallthepartsusingassemblymodule.
   c. Generate the half sectional front view, Top View & side view of the assembly using drawing module. Also generate the Bill of Materials & number the parts shown in the assembly using balloons.

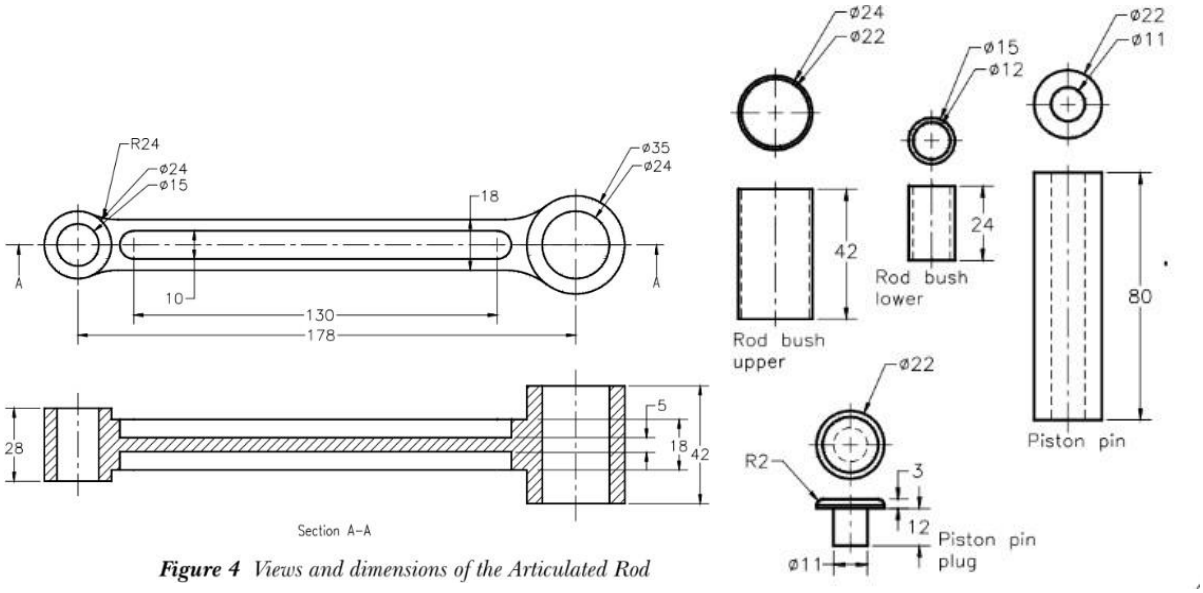


Figure 4 *Views and dimensions of the Articulated Rod*

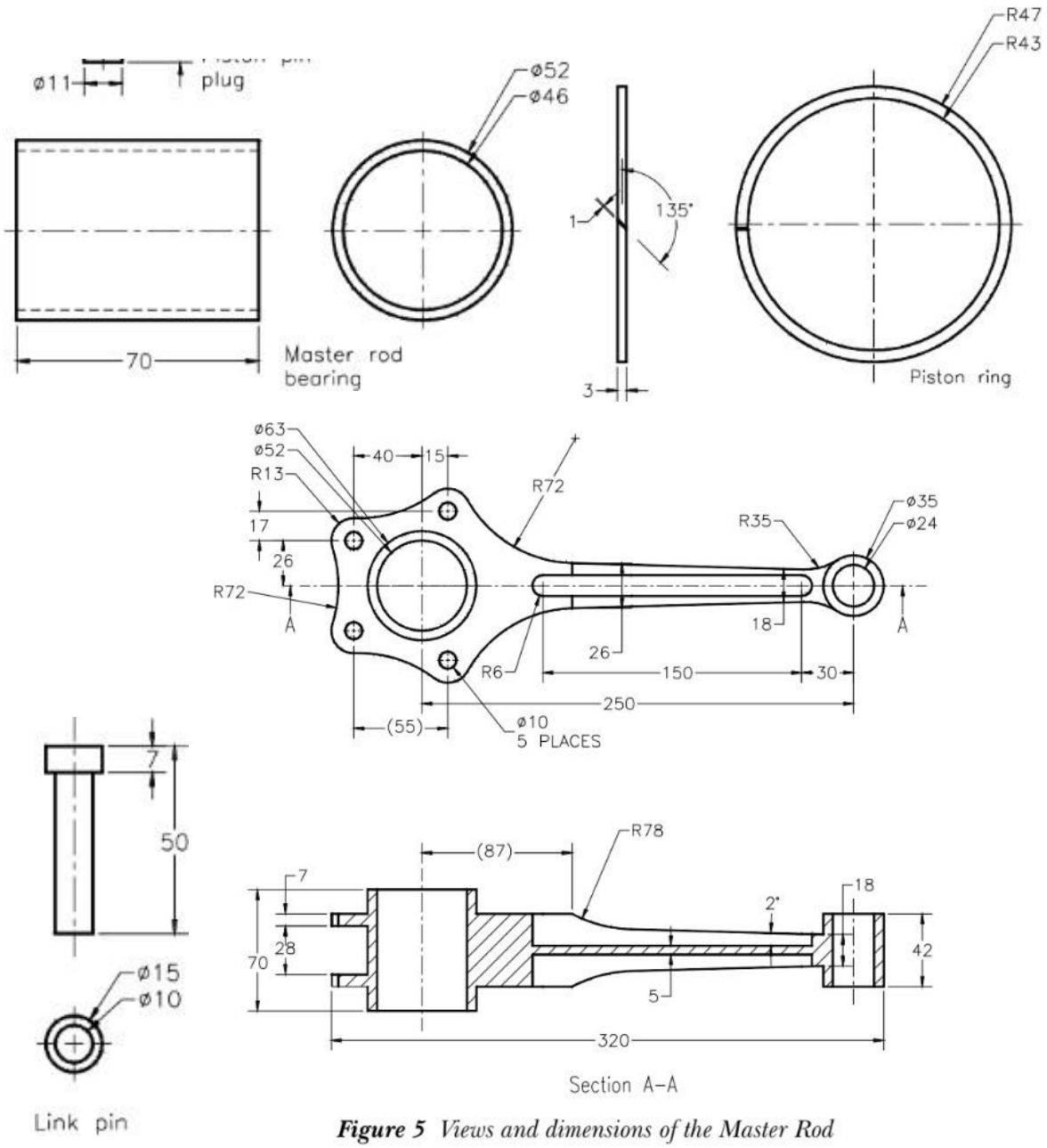


Figure 5 *Views and dimensions of the Master Rod*

Procedure:

1. Modelallthepartsgiveninpartsmodule&applymaterialasshowninthepartstable.
2. Assemblythepartssuitablyusingassemblymodule.
3. Drafttheassembly,markpartnumbersusingballoons&takeprintofthesame.
4. Notedownthefollowing values:
    a. Total massofthe assembly= _____
    b. Distance between centre of gravity of each part from its lowermost point when it isplaced vertically? ____

Precautions:

1. Do not save your files on desktop or C drive. (They will be automatically erased on systemrestart.)
2. SaveyourfileintheDdriveinafolderofyournameorroll number.
3. Don'tinstall,uninstallorchangeanysettingthesystem.

4. Don'ttamperorexchangeanyhardware(mouse/keyboardetc)
5. Informaboutanymalfunctionstotheinstructorrightaway.

Viva Questions:

1. WhataretheapplicationsofEccentrics?
2. WhatisthetotalmassoftheassemblyafterapplyingthematerialsmentionedintheParts Table? __
3. What is the height of centre of gravity of each part from its lowermost point when it is placed vertically? _____

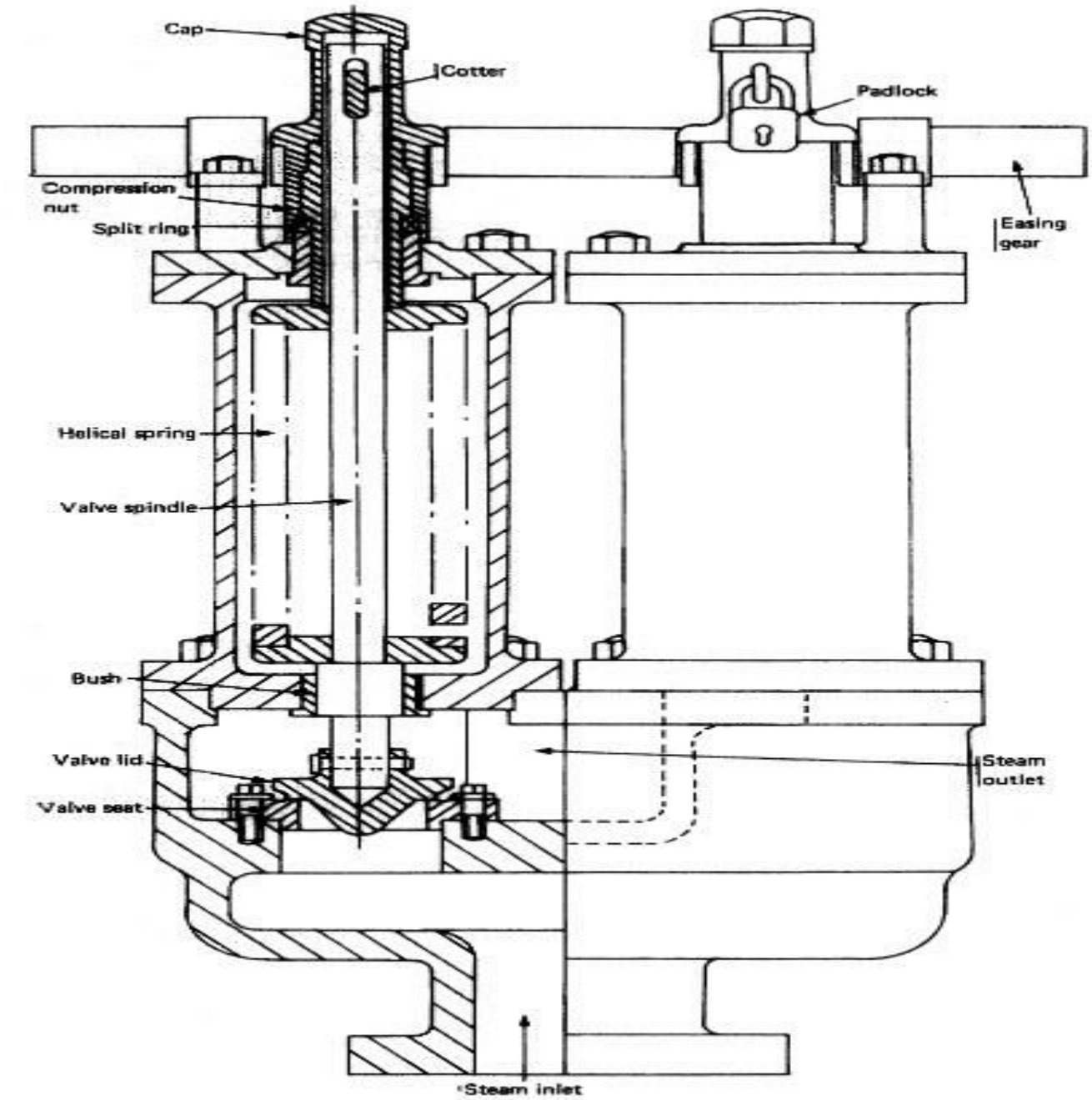
EXPERIMENT:08

Boiler safety valve

Spring-loaded valves are always fitted on board ship because of their positive action at any inclination. They are positioned on the boiler drum in the steam space.

The ordinary spring loaded safety valve is shown in Figure below. The valve is held closed by the helical spring whose pressure is set by the compression nut at the top.

The spring pressure, once set, is fixed and sealed by a Surveyor. When the steam exceeds this pressure the valve is opened and the spring compressed. The escaping steam is then led through a waste pipe up the funnel and out to atmosphere



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EXPERIMENT:09

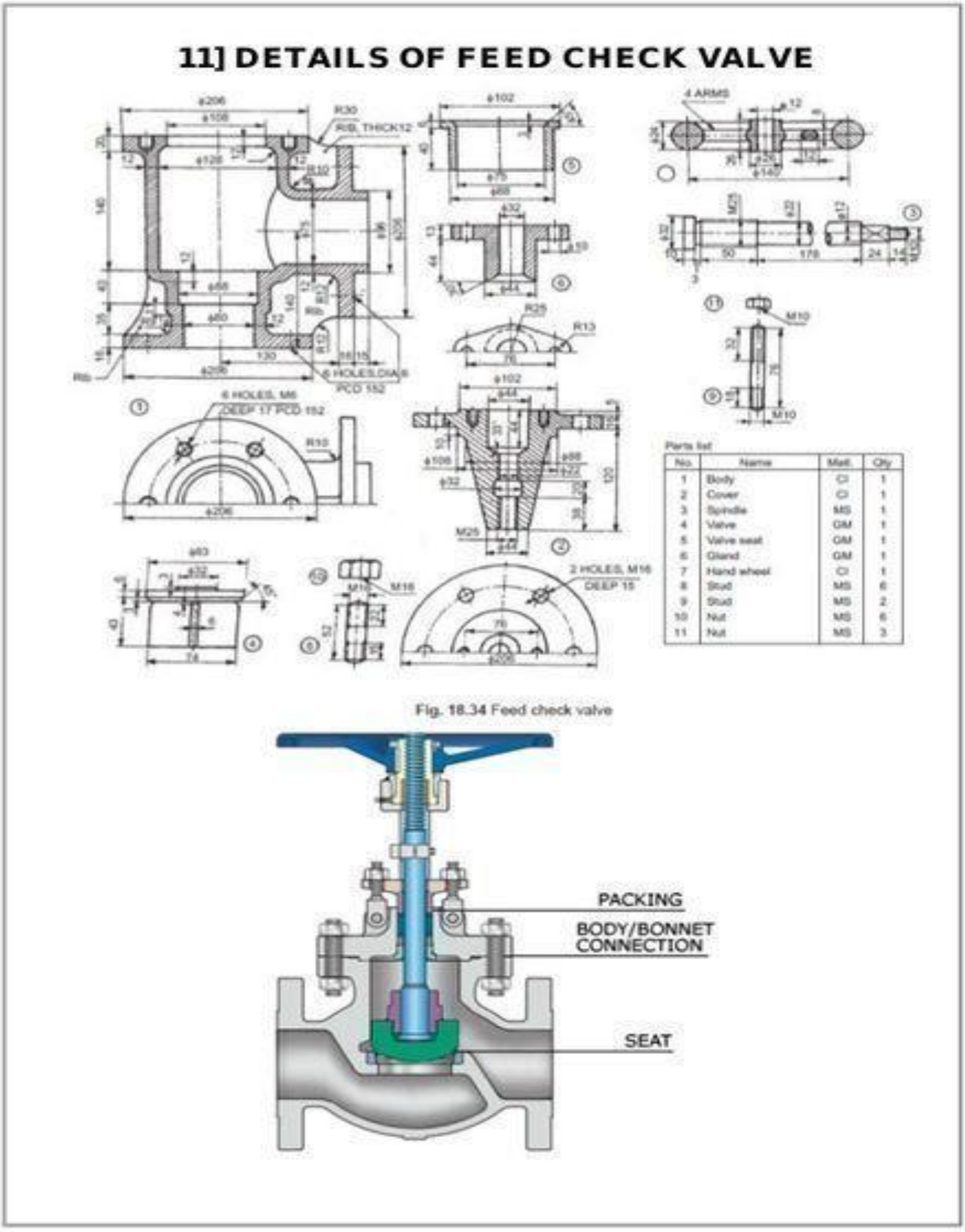

Fig. 18.34 Feed check valve

EXPERIMENT:10

LEVER VALVE