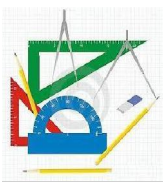


Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bangalore

Prerequisites: Engineering graphics-I and Engineering graphics-II and Sound pictorial

	Course Title: MACHINE DRAWING		
	Scheme (L:T:P) : 0:2:4	Total Contact Hours: 78	Course Code: 15ME34D
	Type of Course: Tutorial and practice	Credit : 03	Core/ Elective: Core
CIE- 25 Marks		SEE- 100 Marks	

Course Objectives:

1. Understanding of drawing, which includes clear visualization of objects and the proficiency in reading and interpreting a wide variety of production and assembly drawings.
2. This course envisages reinforcing and enhancing the knowledge and skill acquired in the earlier two courses

On successful completion of the course, the students will be able to:

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Interpret Conventional symbols as per IS code SP46.	R	1,2,3,10	04
CO2	Understand the Conventional methods of representing threaded fasteners	R	1,2,3,10	12
CO3	Understand the Conventional representation of Riveted joints	U/A	1,2,3,10	12
CO4	Categorize attributes of Production Drawing and Limits, fits, tolerances	U	1,2,3,10	06
C05	Illustrate the significance & use of tolerances of size, forms & positions	U	1,2,3,10	06
C06	Visualize the assembly of a given set of details of machine components	U/A	1,2,3,8,9,10	38
			Total sessions	78

Legend: R; Remember, U: Understand A: Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MACHINE DRAWING	03	03	03	-	-	-	-	2	2	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
 If $\geq 40\%$ of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
 If $< 5\%$ of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks weightage	weightage (%)
			R	U	A		
1	CONVENTIONAL REPRESENTATION	04	15	--	---	15	11.5
2	THREADED FASTENERS	12	---	--	15	15	11.5
3	RIVETED JOINTS	12	--	---	15	15	11.5
4	LIMITS, FITS AND TOLERANCES	06	---	15	--	15	11.5
5	PRODUCTION DRAWINGS	06	--	---	---	---	-----
6	DETAILS TO ASSEMBLY	38	--	---	70(*)	70(*)	54
	Total	78	15	15	100	130	100

Legend: R; Remember, U: Understand A: Application

(*): Compulsory question to be answered

UNITI: CONVENTIONAL REPRESENTATION	04Hrs
---	--------------

Standard convention using SP – 46 (1988)-Materials C.I., M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete and Rubber-Long and short break in pipe, rod and shaft.- Various sections- Half, removed,-Standard convention of Knurling, splined shafts, and chain wheels-Springs with square and flat ends, Gears, sprocket wheel-Countersunk & counter bore

UNITII: THREADED FASTENERS	12Hrs
-----------------------------------	--------------

Screw thread terminology-Conventional representation of External threads and internal threads-Draw the top and front view of hexagonal headed bolt with nut across flat and corner-Draw - square headed bolt across corner and flat-cylindrical headed bolt-Eye bolt-Locking devices-Draw the views of for standard dimensions-lock nut-castle nut-Studs-Tap bolt-Machine screws-washers-Keys-sunk key-Gib head key.(For a given standard diameter with proportions)

UNITIII: RIVETED JOINTS	12Hrs
--------------------------------	--------------

Rivets-types-Types of riveted joints-Draw the sectional front view and top view of-single riveted lap joint, double riveted lap joint with chain riveting and zigzag riveting. Draw the sectional front view and top view of-single riveted butt joint with single and double cover plate - double riveted butt joint with chain riveting and zigzag riveting with double cover plate.

UNIT IV: LIMITS, FITS AND TOLERANCES**06Hrs**

Concept of limits, fits & allowances--Introduction to ISO system of tolerance,-dimensional tolerances-Draw the working drawing plain step turned shaft of varying diameter, indicate the dimensional tolerances

UNIT V: PRODUCTION DRAWINGS**06Hr**

Surface roughness-Indication of machining-symbol showing direction of lay, roughness grades, machining allowances, Machining symbols used in industry

(Suggested Practice:Disassembling of any Physical model having not less than five parts, sketch the minimum views required for each component, measure all the required dimensions of each component.)

UNIT VI: DETAILS TO ASSEMBLY**38Hrs**

Introduction to the unit assembly drawing, steps involved in preparing assembly drawing from Details-Sequence in assembly-Preparation of details and Assembly of parts with Sectional views of- **Socket and Spigot joint Cotter Joint-- Knuckle joint- Protected Flanged coupling- Universal coupling-Plummer Block and Screw Jack (Front, side and top views)**

**TEXT BOOKS**

1. Machine drawing, -K.R. Gopala Krishna Subhas Publishers, Bangalore

REFERENCES

1. Machine Drawing- N.D.Bhatt, Charotar Publication, Anand
2. Machine Drawing-Sidheshwar-Tata McGraw Hill
3. Code of practice for general engineering-IS Code SP 46(1988)- Engineering Drawing Practice for School and colleges
4. Production Drawing-L.K.Narayanan,P.Kannaich,- New Age International Publication

SUGGESTED LIST OF STUDENT ACTIVITIES

Note: the following activities related to unit 5 and for assessing CIE(IA)

1. Each student should submit any one of the following type activity or any other similar activity related to the course and before take up get it approved from concerned Teacher and HOD.
2. Each student should conduct different activity and no repeating should occur

1	Select at least four simple mechanical components each made up of minimum 5-6 Manufacturing operations. Get them approved by teacher. Measure and sketch them in a drawing sheet with dimensions.
2	Select at least one simple mechanical assembly in group of 5-6 students, each made up of minimum 5-6 manufacturing operations. Get them approved by teacher. Measure and sketch them in a drawing sheet with dimensions. Example- assembly of any coupling, carburetor, machine vice, fuel pump, tail stock etc.
3	Bring Actual assembly from workshop/industry, measure dimensions, sketch it and make 2D production drawing for the same.

Course Delivery:

The course will be delivered through lectures and Demonstration and practices

NOTE:.

1. Students should use two separate A3 size sketchbooks, one for class work and another for assignment.
2. Students should solve assignment on each topic. The sessional marks will be awarded on the basis of Graded exercises and assignment
3. Use half imperial size drawing sheet for term work

MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY

RUBRICS FOR ACTIVITY(5 Marks)						
Dimension	Unsatisfactory	Developing	Satisfactory	Good	Exemplary	Student Score
	1	2	3	4	5	
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	Ex: 4
Fulfill team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	5
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	3
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment method	CIE	IA	Students	Graded Exercises- Average marks all graded exercises to be computed.	20	Drawing Sheets	1,2,3,4,5,6
	SEE End Exam			Student activities	05	Log of activity	1,2,3,4,5,6
				End of the course	100	Answer scripts at BTE	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6- Effectiveness of Delivery of instructions & Assessment Methods

*CIE – Continuous Internal Evaluation

*SEE – Semester End Examination

Note:

1. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

Note to IA verifier: The following documents to be verified by CIE verifier at the end of semester

1. Drawing sheet files (Two /Three students)(20 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

NOTE:THIS SUBJECT SHOULD THOUGHT IN A BATCH OF 15 TO 20 STUDENTS,TEACHER INCHARGE PER BATCH HAS TO MONITER, EVALUATE OR ASSESS THE STUDENTS.

MODEL QUESTION PAPER

III Semester Diploma in Mechanical Engineering MACHINE DRAWING

Time: 4 Hours

[Max Marks: 100]

Note: Answer any ONE from **Part A** and **Part B**, **Part-C** is compulsory

Part A

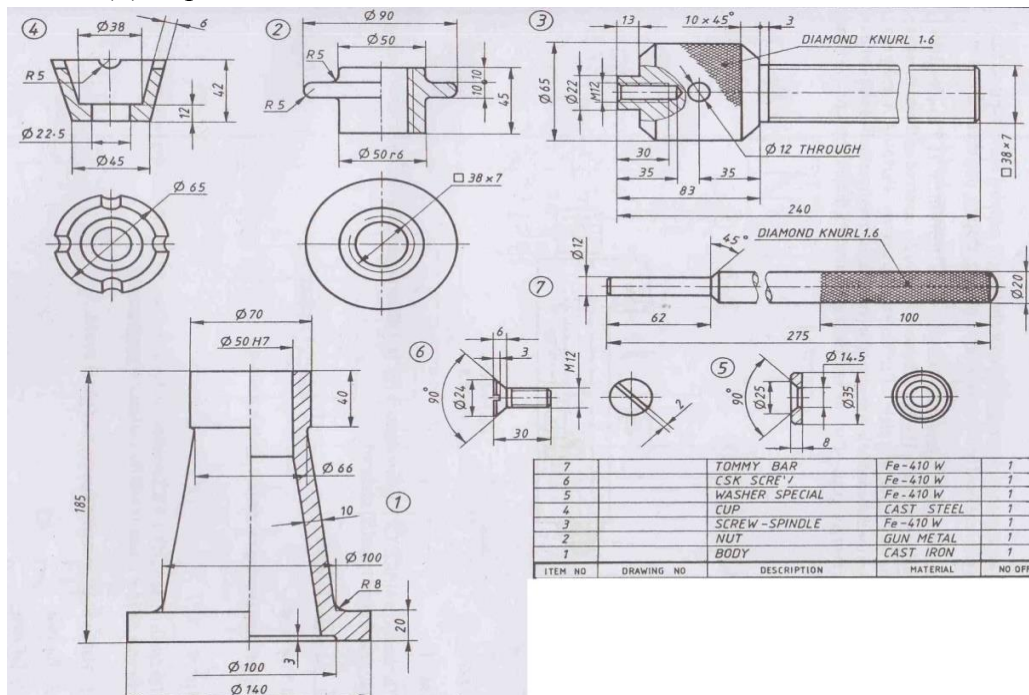
- 1.a) Draw the conventional representation of the following materials. -9M
i) Wood (ii) steel (iii) rubber
- b) Draw the conventional representation of the following sections. -6M
(i) Bottom-half in section (ii) Right - half in section
2. Draw the diagrammatic representation of the following -15M
(i) Clearance fit (ii) Interference fit (iii) Transition fit

Part B

2. Draw the front and top view of ISO threaded Square bolt and Nut of 100 mm long with a threaded length of 50mm. The diameter of the bolt is 20 mm across corner-15M
3. Draw to 1:1 scale the sectional front view and top view of a single riveted Butt joint with double cover plate. The thickness of the plate is 9 mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions. -15M

Part C

1. The detail parts of a SCREW JACK is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing
(i) Front view in section -45M
(ii) Top view - 25M



MODEL QUESTION BANK

III Semester Diploma in Mechanical Engineering

MACHINE DRAWING

(15 MARKS QUESTIONS)

PART-A & PART-B

CO 01: INTERPRET CONVENTIONAL SYMBOLS AS PER IS CODE SP46.

LEVEL:REMEMBER

1. a) Draw the conventional representation of the following materials. -9M
i) Lead (ii)Glass (iii) fibre
b) Draw the conventional representation of the following sections.
(i) Top-half in section (iv)Left - half in section-6M
2. a) Draw the conventional representation of the following materials. -9M
i) Wood (ii)steel (iii) rubber
b) Draw the conventional representation of the following sections.
(i) bottom-half in section (ii)Right - half in section -6M
3. a) Draw the conventional representation of the following materials. -9M
i)) Cast iron (ii)plywood (iii) rubber
b) Draw the conventional representation of the following sections.
(i) Top-half in section (ii)Right - half in section -6M
4. Draw the conventional representation of the following sections.
a) (i) Knurling operation (ii) splined shafts and -Springs with square and flat ends
(iii) chain wheels -9M
b) Draw the conventional representation of the following sections.
(i) Top-half in section (ii)Right - half in section -6M
5. Draw the conventional representation of the following sections.
a) (i)Knurling operation(ii)Counter sunk & counter bore(iii)Spur gear -9M
b) Draw the conventional representation of the following sections.
(i) Top-half in section (ii)Right - half in section -6M

CO 02: UNDERSTAND THE CONVENTIONAL METHODS OF REPRESENTING THREADED FASTENERS

LEVEL:APPLICATION

1. Draw the front and top view of ISO threaded Hexagonal bolt and Nut of 120 mm long with a threaded length of 60 mm. The diameter of the bolt is 24mm across corner.
2. Draw the front and top view of ISO threaded Hexagonal bolt and Nut of 100 mm long with a threaded length of 50mm. The diameter of the bolt is 20 mm across Flat
3. Draw the front and top view of ISO threaded Square bolt and Nut of 100 mm long with a threaded length of 50mm. The diameter of the bolt is 20 mm across Flat

4. Draw the front and top view of ISO threaded Square bolt and Nut of 100 mm long with a threaded length of 50mm. The diameter of the bolt is 20 mm across corner
5. Draw the front and side view of a lifting Eye bolt of diameter 24mm and indicate all the proportions.
6. Draw the front and Top view of a split pin method of locking of an ordinary Nut of diameter 24mm and indicate all the proportions.

CO 03: UNDERSTAND THE CONVENTIONAL REPRESENTATION OF RIVETED JOINTS

LEVEL:APPLICATION

1. Draw to 1:1 scale the sectional front view and top view of a double riveted lap joint with chain riveting. The thickness of the plate is 10mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.
1. Draw to 1:1 scale the sectional front view and top view of a double riveted lap joint with Zig-zag riveting. The thickness of the plate is 10mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.
2. Draw to 1:1 scale the sectional front view and top view of a single riveted Butt joint with double cover plate. The thickness of the plate is 9 mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.
4. Draw to 1:2 scale the sectional front view and top view of a single riveted Butt joint. The thickness of the plate is 20 mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.
5. Draw to 1:1 scale the sectional front view and top view of a double riveted Butt joint with double cover plate with change riveting. The thickness of the plate is 12mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.
6. Draw to 1:1 scale the sectional front view and top view of a double riveted Butt joint with double cover plate with change Zig-zag riveting. The thickness of the plate is 12 mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.

CO 04: CATEGORIZE ATTRIBUTES OF PRODUCTION DRAWING AND LIMITS, FITS, TOLERANCES

LEVEL: UNDERSTANDING

1. Draw the diagrammatic representation of the following -15M
 - (i) Clearance fit (ii) Interference fit (iii) Transition fit
2. a) Draw the designation of shaft of basic size 20mm of grade 8 with upper deviation zero --7M
 - b) Dimension a hole of base size 30mm grade 7 with lower deviation zero by using letters and numerals on a sketch. -8M

Part B

(70 MARKS QUESTION WHICH IS COMPULSORY)

(FOR END EXAM ANY TWO VIEWS TO BE ASKED)

CO 06: VISUALIZE THE ASSEMBLY OF A GIVEN SET OF DETAILS OF MACHINE COMPONENTS

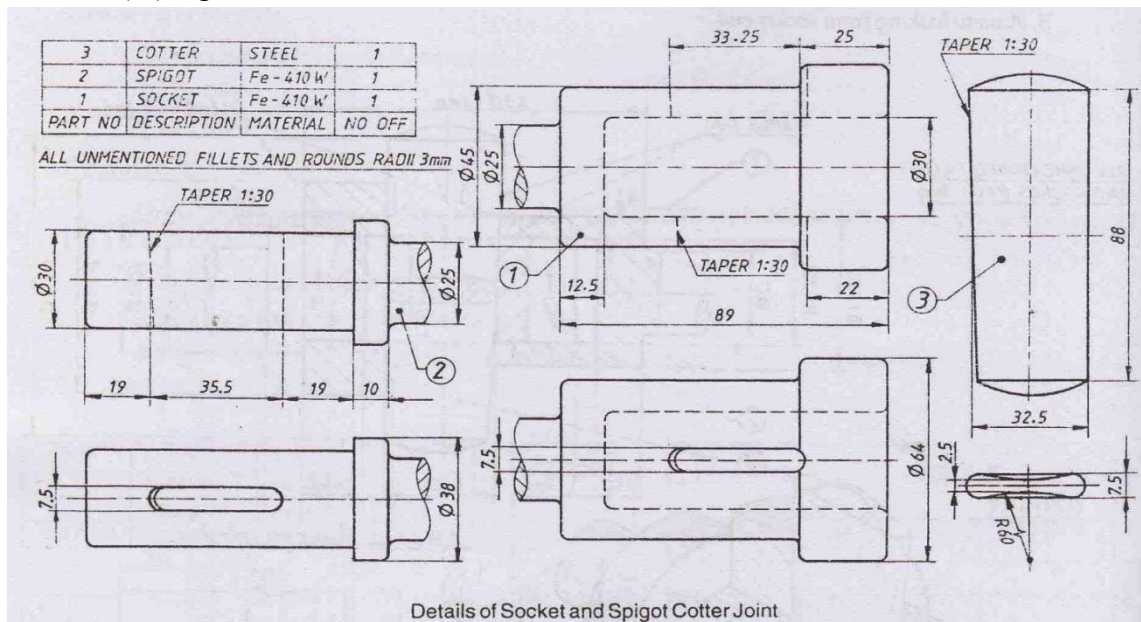
LEVEL: APPLICATION

1. The detail parts of a SOCKET AND SPIGOT JOINT COTTER JOINT is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing

(i) Front view with Top-half in section.

(ii) Top view

(iii) Right view



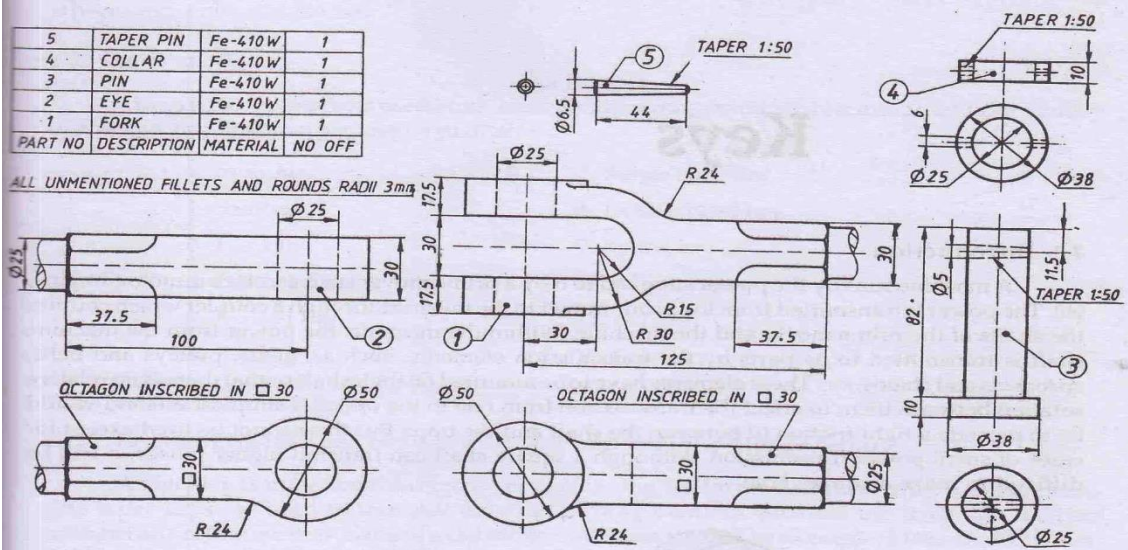
2. The detail parts of a KNUCKLE JOINT is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing

(i) Front view in section

(ii) Top view

(iii) Left view

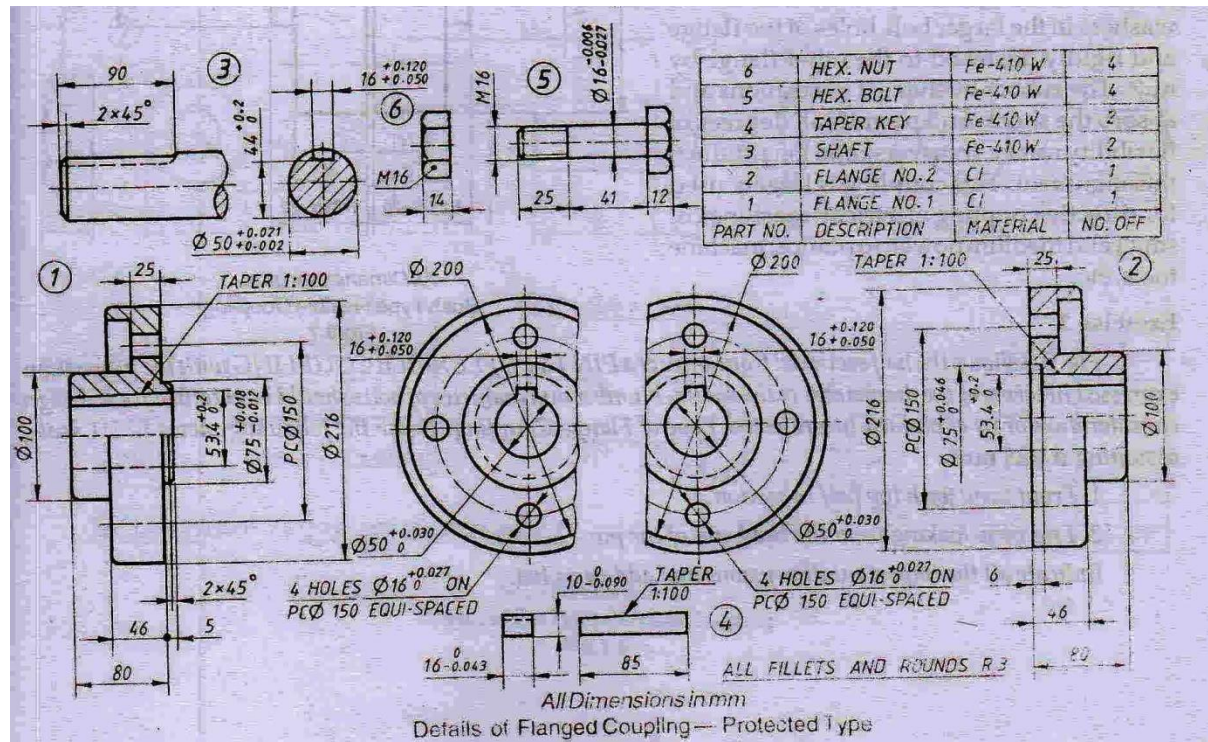
5	TAPER PIN	Fe-410W	1
4	COLLAR	Fe-410W	1
3	PIN	Fe-410W	1
2	EYE	Fe-410W	1
1	FORK	Fe-410W	1
PART NO	DESCRIPTION	MATERIAL	NO OFF



Details of a Knuckle Joint

3. The detail parts of a PROTECTED TYPE FLANGED COUPLING is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing

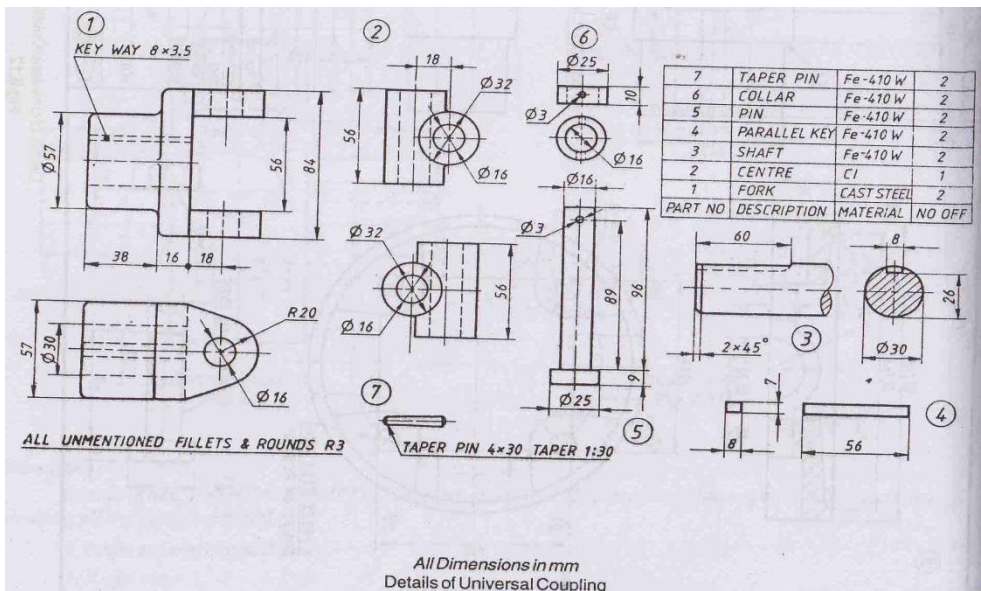
- (i) Front with Top-half in section
- (ii) Top view
- (iii) Left side view



All Dimensions in mm
Details of Flanged Coupling — Protected Type

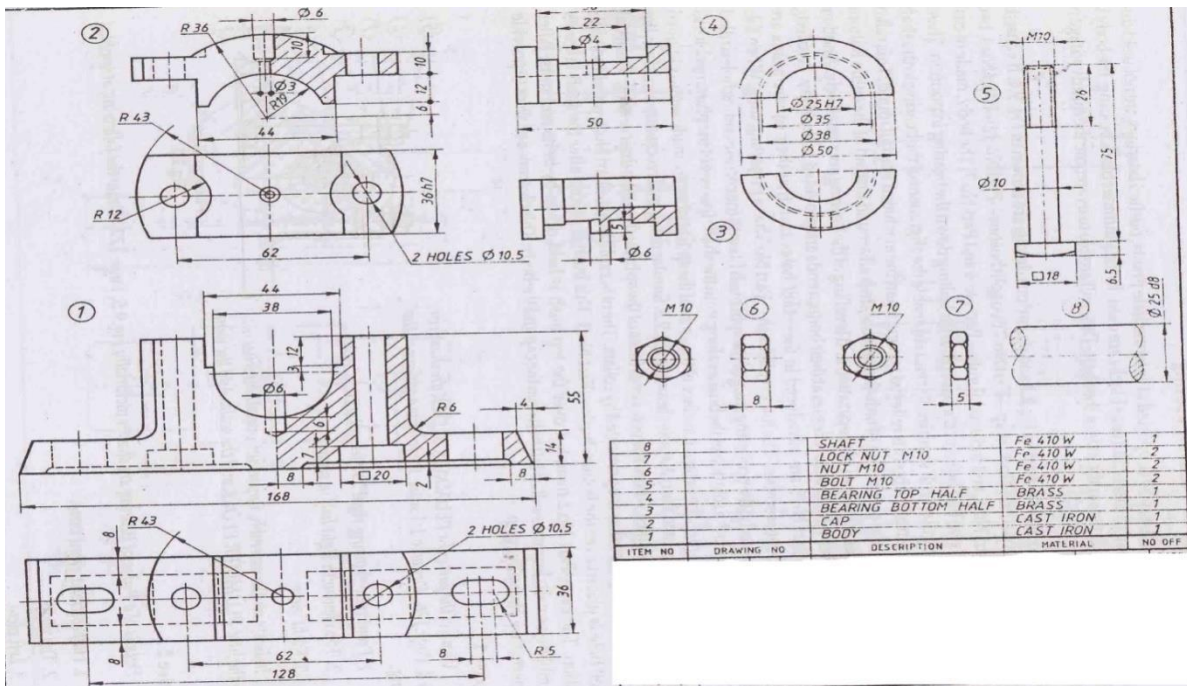
4. The detail parts of a UNIVERSAL COUPLING is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing

- (i) Front view
- (ii) Top view
- (iii) Left side view



5. The detail parts of a PLUMMER BLOCK is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing

- (i) Front view with Right half in section
- (ii) Top view



6. The detail parts of a SCREW JACK is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing

- (i) Front view in section
- (ii) Top view
- (iii) Side view

