I

Name Pooja S. Vaje
Roll No. 24 Year 20 19 20 20
Exam Seat No. 271971

ELECTRICAL GROUP | SEMESTER- VI | DIPLOMA IN ENGINEERING AND TECHNOLOGY

A LABORATORY MANUAL

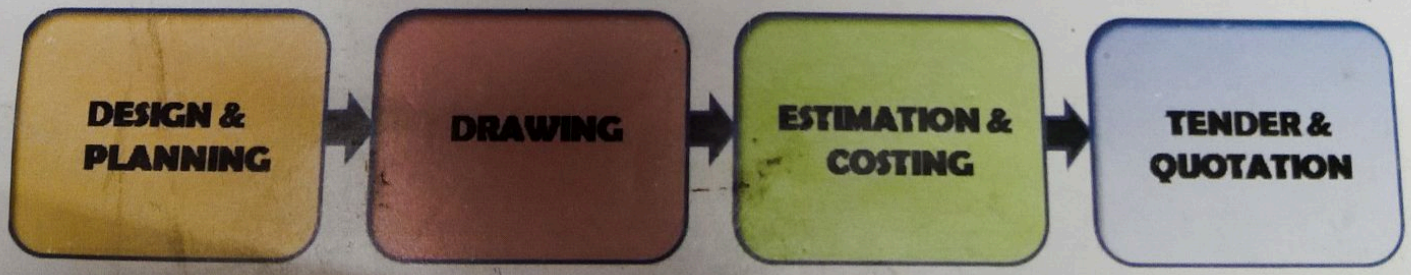
FOR

ELECTRICAL ESTIMATING AND CONTRACTING

(22627)

(EE / EP / EU)

ACTIVITES UNDER ELECTRICAL ESTIMATION AND CONTRACTING



MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI
(Autonomous) (ISO 9001 :2015) (ISO / IEC 27001:2013)

Practical No.1 : Draw plan of electrical installation scheme for given 1BHK residential unit using Auto-cad.

I Practical Significance

Every diploma electrical engineer must have the knowledge of Auto-cad for making the drawing of various electrical installations and identify the symbolic representation of appliances/ equipment, distribution board and their position / location as per IE rules.

Relevant Program Outcomes (POs)

- **Discipline knowledge:** Apply Electrical Engineering knowledge to solve broad based Electrical Engineering related problems.
- **Environment and sustainability:** Apply Electrical engineering solutions for sustainable development practices in societal and environmental contexts.
- **Engineering tools:** Apply relevant Electrical technologies and tools with an understanding of the limitations.
- **The engineer and society:** Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in the field of Electrical engineering.
- **Ethics:** Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice in the field of electrical engineering.
- **Communication:** Communicate effectively in oral and written form.

II Competency and Skills

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Plan electrical installations with their cost estimates.

III Relevant Course Outcome(s)

- Interpret various electrical diagrams.
- Prepare estimate of domestic and commercial electrical installations.

IV Practical Outcome

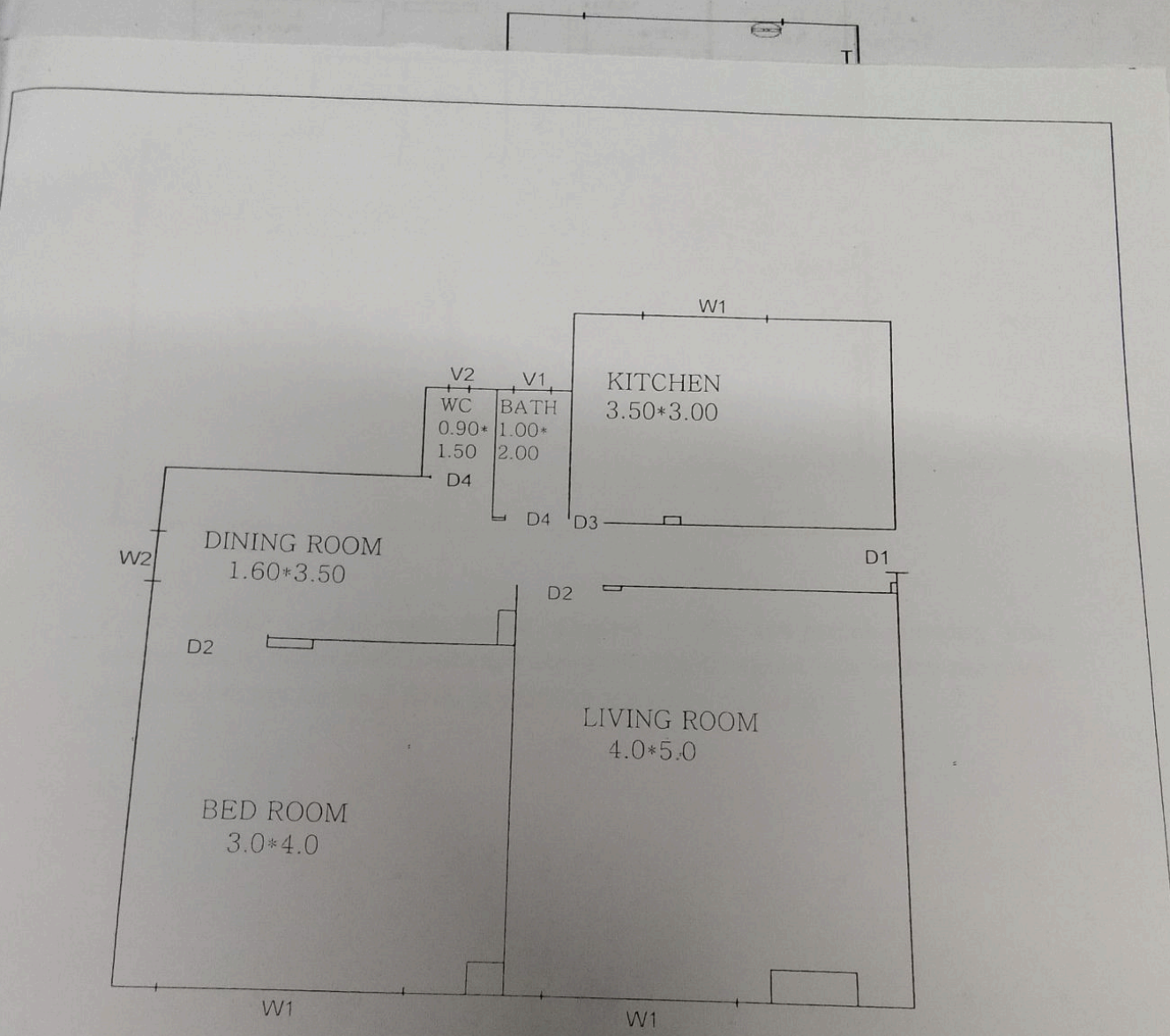
- Draw single line wiring diagram of above residential installation.
- Draw the symbols of installation components/ equipemnets on the above plan showing their location.
- Draw the installation wiring route diagram for the above plan.

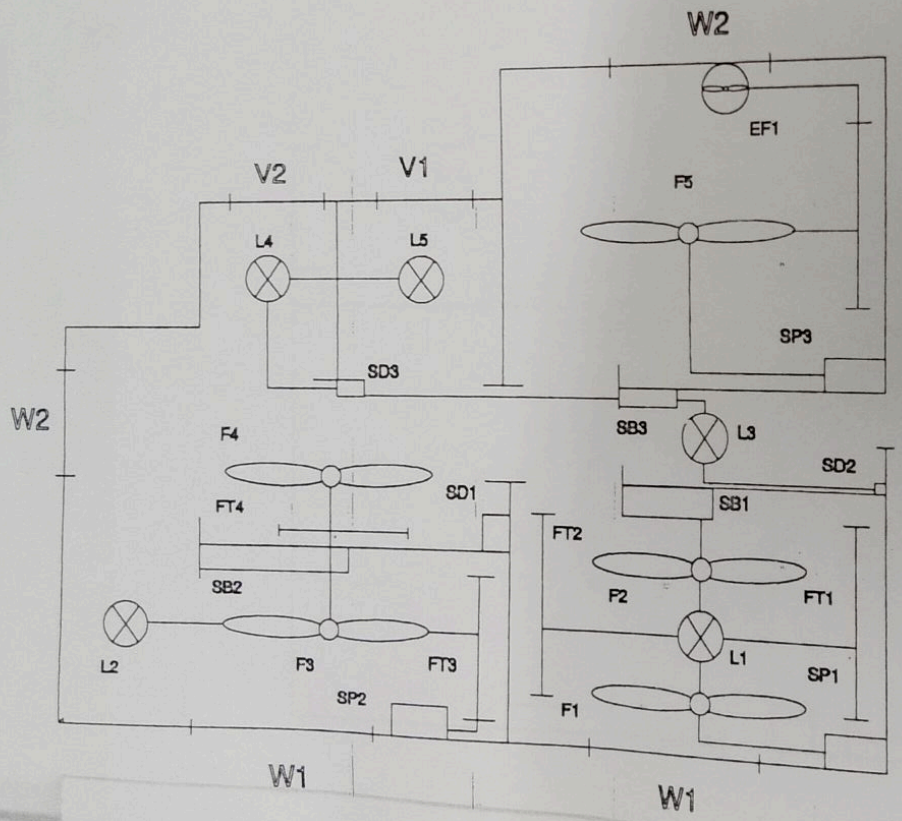
V Minimum Theoretical Background

- Meaning and purpose of symbols used to represent electrical equipment in given electrical installation system.
- Application and need of electrical accessories and protective devices based on type of installation.
- Determining the Size/Rating of distribution board, wires and protective equipment.
- IE rules pertaining to electrical installation.
- Knowledge of Auto-cad.

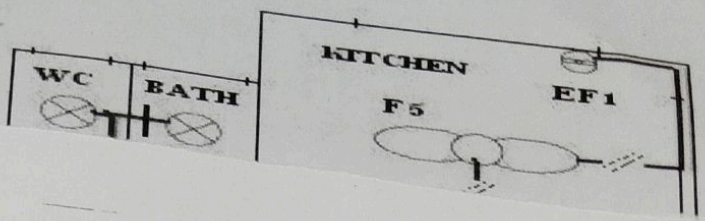
- D1, D2, D3 and D4: Doors of similar dimensions.
- W1 and W2: Windows of similar dimensions.
- V1, V2: Ventilation openings/ window.

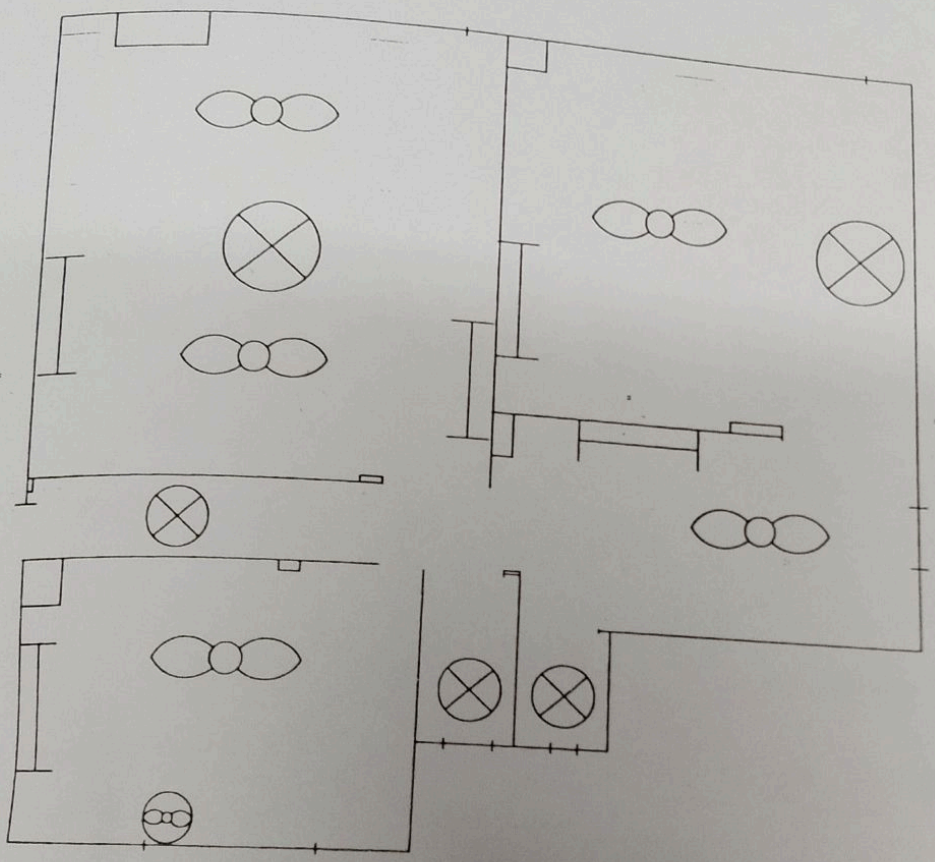
b. Paste labelled drawing representing location of electrical components, sub-distribution board by using standard symbols for the provided/ suggested to opt for the 1 BHK residential unit using Auto-cad.

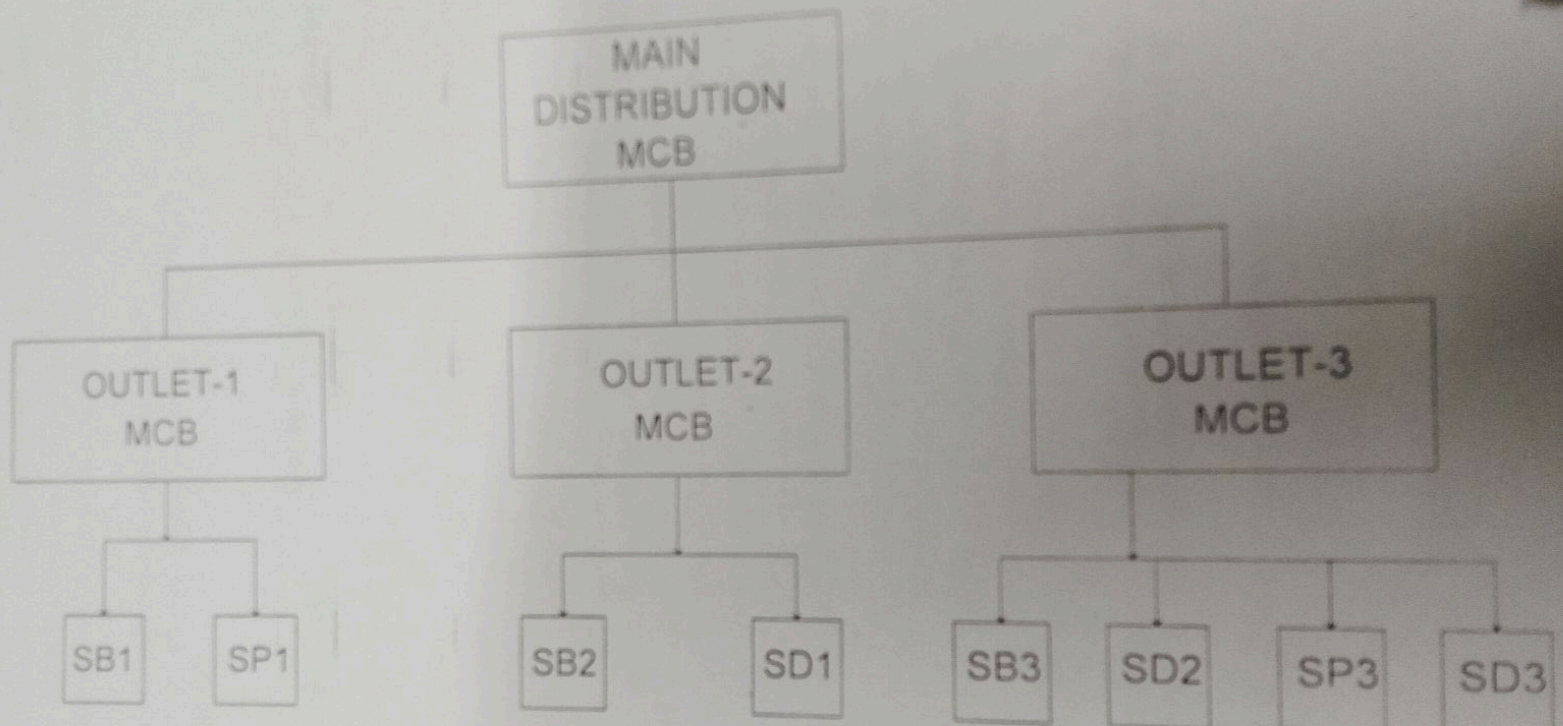




SR.NO	NOTATION	MEANING
1.	F1,F2	CEILING FAN
2.	EF1	EXHAUST FAN
3.	FT1,FT2	FLUROSCENT TUBE
4.	L1,L2	LAMP
5.	SB1,SB2	SWITCH BOARD
6.	SP1,SP2	POWERPOINT BOARD
7.	SD1,SD2...	SUBSWITCH BOARD


WC
BATH
KITCHEN
F5
EF1




MAIN
DISTRIBUTION
MCB
OUTLET-1
MCB
OUTLET-2
MCB
OUTLET-3
MCB
SB1
SP1
SB2
SD1
SB3
SD2
SP3
SD3

Procedure

1. Collect the plan and requirement of electrical points from the client/ contractor/ civil consultant/ as suggested by course teacher.
2. Draw the provided/ suggested to opt for (from collected) plan in auto-cad, clearly indicating the position of door and window.
3. Draw the appliances and distribution board, power points and light point by representing with symbols and colour coding/labeling.
4. Draw conduit route to join all the points with respective sub-distribution board by shortest distance.
5. Mark the number of conductors in respective conduit.
6. Draw electrical wiring diagram from plan drawn in step 4 and 5.
7. Prepare list of material.

Resources Used

Sr. No.	Name of Resource	Provided/ Suggested to opt for the Plan	Quantity
1	Auto-Cad Soft tool		
2			

XI Actual Procedure Followed (use blank sheet if space is not sufficient)

lect the plan ② requirement of electrical points from client ve provided to opt for plan ③ auto-cad, clearly indica- the position of door & window ④ Draw appliances & D.B, power t & light point by representing with symbols ⑤ Draw conduit te to join all points with respect sub-D.B ⑥ Mark no of cond- ors on conduit ⑦ Draw electrical drawing from plan ⑧ Prepare list of material

XII Precautions Followed

① Use standard electrical symbols as per I.E rule to represent the electrical installation accordingly ② Segregate wiring installation with proper suitable colours based on distribution outlets

XIII Assumption and Calculations (size/rating of wire, conduit and RCCB/MCB. Quote IS codes relevant to selection) (should be as per relevant IE rules and regulations)

(Use blank sheet if space is not sufficient)

XIV **Results (Comment on list of material, size and rating of protective device)**
to draw plan of electrical installation scheme for given 1 BHK residential unit using auto-cad

XV **Interpretation and assumption (Made while drawing electrical plan for the given installation system)** (As per IE rules related to installation)
he draw the symbols of installation co-mponents/equipments on 1 BHK plan showing their locations

XVI **Conclusions** (Relevance to deciding the position of appliances, selection of shortest wiring route and its impact on costing)
he understood the how to draw the electrical installation scheme for 1 BHK residential unit using autocad

XVII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. Write the significance of electrical symbols in electrical drawing.
2. Write IE rule pertaining to domestic installation system.
3. Describe the procedure for selecting the size / rating of wire and MCB.
4. Illustrate the criteria to decide number of sub distribution circuits.
5. Differentiate between residential and commercial installation systems.

Total load =
load
Fan
Exhaust Fan
Fluorescent lamp
Lamp
Power Socket
Socket
Current =
Future ex
load on SB
Fan = 2×6
Tube = 2×4
lamp = 1×6
5 Socket =
∴ So capac
load on
Fan = 1×6
Tube = 1×
lamp = 1×
5 Socket =

Total load :-

DATE / /

load	Quantity	Wattage of each	Total Wattage
Fan	5	60 W	300 W
Exhaust Fan	1	30 W	30 W
Fluorescent lamp	4	60 W	240 W
Lamp	5	40 W	200 W
Power Socket	9	1000 W	9000 W
Socket	9	100 W	900 W
			4730 W

$$\text{Current} = \frac{\text{Power}}{\text{Voltage}}$$

$$= \frac{4730}{230}$$

$$= 20.56 \text{ Amp}$$

Future expansion = $20.56 \times 1.5 = 30.84$ Amp

load on SB_1

Fan = $2 \times 60 = 120$ W

Tube = $2 \times 40 = 80$ W

lamp = $1 \times 60 = 60$ W

5 Socket = $2 \times 100 = 200$ W

460 W

$$I = \frac{P}{V} = \frac{460}{230} = 2 \text{ A}$$

∴ So wire required SB_1 connection of load is $1 mm^2$

load on SB_2

Fan = $1 \times 60 = 60$ W

Tube = $1 \times 40 = 40$ W

lamp = $1 \times 60 = 60$ W

5 Socket = $2 \times 100 = 200$ W

360 W

$$I = \frac{P}{V} = \frac{360}{230} = 1.56 \text{ A}$$

∴ So load required for SB_2 connection & load ps 1 mm^2.

- load on SB_3

Fan = $1 \times 60 = 60$ W

Tube = $1 \times 40 = 40$ W

Exhaust fan = $1 \times 30 = 30$ W

5 A socket = $2 \times 100 = 200$ W

330 W

$\therefore I = \frac{P}{V} = \frac{330}{230} = 1.4$

∴ So wire required for SB_3 connection ps 1 mm^2

- Load on SP_1

Fan = $1 \times 60 = 60$ W

Tube = $1 \times 40 = 40$ W

5 A Socket = $1 \times 100 = 100$ W

200 W

$\therefore I = \frac{P}{V} = \frac{200}{230} = 0.36$

∴ So wire required for SP_1 connection ps 1 mm^2

- load on SP_2

5 A socket = $1 \times 100 = 100$ W

lamp = $1 \times 60 = 60$ W

160 W

$\therefore I = \frac{P}{V} = \frac{160}{230} = 0$

- Load on SP_3

5 A socket = $1 \times 100 = 100$ W

lamp = $2 \times 60 = 120$ W

220 W

$\therefore I = \frac{P}{V} = \frac{220}{230} = 0.9$

∴ Wire required for SP_1, SP_2 & SP_3 connection ps 3.5 A because current ps 15 A.

DATE

DATE / /

Requirement of casing capping

- From MB to SB3 = 3.5 m + 1 m

H → From SB3 to SP3 = 2.62 m

SB3 to Fan = 1.5 m

Fan to tube = 1.75 m

Tube to E.F = 2.37 m

V → 1.5 + 1.5 + 1.+1 = 5 m

H → HB3 to t3 = 1.45 m

L3 to SP2 = 2.4 m

SB3 to SB1 = 3.85 m

V → 4.5 m

SB1 to F1 → 1.5 + 1.25 + 1 = 3.75 m

F1 to L1 → 1 m

L1 to F1 → 9.5 m

L1 to FT1 → 3.5 m

L1 to EF → 1 m

F1 to SP1 → 4.37 m

SB3 to SP3 = 3.62 m

SB3 to L4, L5 = 1.5 to 0.75 + 0.45 + 0.25

= 3.65 m

FT2 to FT3 = 0.25 m

FT3 to SP2 = 2 + 1.5 ≠ 3.5 m

FT3 to F3 = 1.5 m

T3 to L2 = 1.5 m

F3 to L2 = 1.5 m

F3 to SB2 = 2 + 1.5 = 3.5 m

SB2 to FT4 = 6.25 + 1.5 + 1 = 2.75 m

FT4 to SP1 = 1.30 + 1.5 = 2.8 m

FT4 to F4 = 1.75 m

73.3 m

Wastage 15% = $\frac{73.38 \times 15}{100}$ = 11.007 m

Total casing capping required = 73.38 + 11.007

= 84.38 m

Calculation of phase wire

2.55 mm² phase and neutral wire are used

MB to SB3 = 4.5 m + 2.5

MB to SP3 = 2.62 m + 3

SB3 to SB1 = 3.85 m + 3

SB1 to SB2 = 9.75 + 3

SB1 to SP1 = 7 m

SB2 to SP2 = 8 m

47.22 m

Wastage 15% = $\frac{47.22 \times 15}{100}$ = 7.08 m

Total phase wire = 47.22 + 7.08

= 54.30 m

1 mm² wire required for phase wire

SP2 to L3 = 2.4 m

SP3 to F3 = 3m

SB3 to T3 = 5.75m

SB2 to F1 = 6.12 m

SB3 to SP3 = 5.87 m

SP3 to L4 = 5.87 m

to L5 = 2.7 m

SB3 to T2 = 8.25 m

SB2 to SP3 = 6m

SP1 to FT4 = 4 m

SP1 to F4 = 4 m

SB2 to T3 = 9 m

SB2 to T3 = 9m

SB2 to FT = 6m

DATE

SB1 to L1 = 6.75 m
SB1 to F1 = 3.75 m
Wastage = 15% = 14.226 m
Total = 94.84 + 14.226 = 109.06 m
SB1 to F1 = 5.75 m
SB1 to FT1 = 8.25 m

SB2 to L2 = 5 m
94.84 m

Requirement of neutral wire -
SB2 to F3 = 3 + 2.75 + 4.25 = 10 m
SB2 to SP3 = 5.87 + 2.27 + 0.95 = 9.52 m
SB1 to TD2 = 3.75 + 1 + 6 + 6 + 1 = 17.75 m
SB2 to TD1 = 6 + 4 + 0.8 = 10.08 m
SB1 to SD2 = 6.75 + 4.4 = 11.15 m
SB2 to F2 = 3 + 4 + 3 = 10 m
63.5 m

Wastage +5 % = 10.21
Total neutral wire = 68.5 + 10.27 = 78.27 m

Requirement of earth wire
47.22 + 4 = 51.22 m
Wastage 15% = 7.68 m
Total = 51.22 + 7.68 = 58.90 m

Estimation.

Accessories	Quantity	Unit	Rate
ECDP (32 A)	1	Nos	
Casing capping wire	83	m	
2.5 mm2 red black	54	m	
5 mm2 phase	105	m	
Neutral (black & green)	79	m	
Lamp	5	Nos	

4.	Fan	5	Nos
5.	Fluorescent lamp	5	Nos
6.	5A socket	9	Nos
7.	5 A Switch	25	Nos
8	Exhaust fan	1	Nos
9	Power socket	3	Nos
10	Holder	5	Nos
11	ceiling rose	10	Nos
12	Junction box	7	Nos
13	one way	6	Nos
14	two way	1	Nos
15	Three way	1	Nos
16	Four way	1	Nos
17	wall plug	1	Pack
18	Screw (30×8 mm)	1	Box
19	Switch board	6	Nos
20	L & T bent	12	Nos
21	Insulation type	3	Nos
22	Coller	12	Nos

[Space for answers]

Q-1- Ans :- Significance of electrical symbols :-
An electrical schematic diagram or ckt diagram is a drawing that shows the connection and components on an electrical ckt. It makes it easier to understand how to build a particular ckt. We use symbols for the component on ckt diagrams because its quicker & easier less artistic skill.

Q-2- Ans :- IE rules for domestic installation :-
- The total load on the ckt should not exceed 800 W.
- No of points should not exceed 10 on an ckt.
- The lighting & power devices should have different ckt.
- The domestic wiring 3 pin plug should be used only.
- All switches should be connected through live wire.

Q-4- Ans :- Criteria for decide no of sub-distribution ckt :-
- The code requires that the maximum copper loss on every sub-main ckt should not exceed 1.5 % of the total active power

transmitting along the ckt conductors at rated ckt current similar approach could be followed for sizing conductor of for feeder ckt.

Q-5-Ans:-

Residential system	Commercial system
① Used 1 ϕ power	① Used 3 ϕ power
② Typically plastic sheathed wiring used	② In commercial construction conduit is always used

Q-3-Ans:-

① You know about the type of MCB, you should analyse the kind that would best suit your household device

② Before choosing type of MCB, it's essential to find out few technical details

③ First check what V.rg & freq? with which device functions like if it is AC or DC

④ Next note the starting current load & trip characteristics

⑤ Additionally see if there are any extra

features like manual

XVIII References / Suggestions for Further Reading

1. https://ask-the-electrician.com/wiringdiagrams.html
2. https://www.btechguru.com/courses--nptel--electrical-engineering-video-lecture--ee.ht..
3. https://www.electricaltechnology.org/2013/09/electrical-wiring.htm
4. https://www.howstuffworks.com/search.php?terms=electrical%20installatio
5. https://www.electrical4u.com/electrical-engineering-articles/utilities/
6. http://www.neca-neis.org/the-standards
7. http://www.metlabs.com/product-safety/2011-national-electrical-code-nec-updates-standard-for-the-safe-installation-of-electri

XIX Assessment Scheme

Performance indicators	Weight-age
Marks: 25	
Drawing using AutoCAD	40
Understanding line diagram	25
List of material	15
Answer to questions	10
Submission of report in time	10
Total	**100 %**

Names of Student Team Members

1. Pooja Vaje
2. .....
3. .....
4. .....

Marks Obtained			Dated signature of Teacher
Drawing Skill (10)	**Understanding (15)**	**Total (25)**	

Practical No.2 : Draw plan of electrical installation scheme for given small commercial unit using Auto-cad.

I Practical Significance

Every diploma electrical engineer must have the knowledge of Auto-cad for making the drawing of Commercial electrical installations and identify the symbolic representation of appliances/equipment, distribution board and their position / location as per IE rules. The safety norms must be known while carrying out installation in electrical system.

Relevant Program Outcomes (POs)

- **Discipline knowledge:** Apply Electrical Engineering knowledge to solve broad based Electrical Engineering related problems.
- **Environment and sustainability:** Apply Electrical engineering solutions for sustainable development practices in societal and environmental contexts.
- **Engineering tools:** Apply relevant Electrical technologies and tools with an understanding of the limitations.
- **The engineer and society:** Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in the field of Electrical engineering.
- **Ethics:** Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice in the field of electrical engineering.
- **Communication:** Communicate effectively in oral and written form.

II Competency and Skills

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Plan electrical installations with their cost estimates.**

III Relevant Course Outcome(s)

- Interpret various electrical diagrams.
- Prepare estimate of domestic and commercial electrical installations.

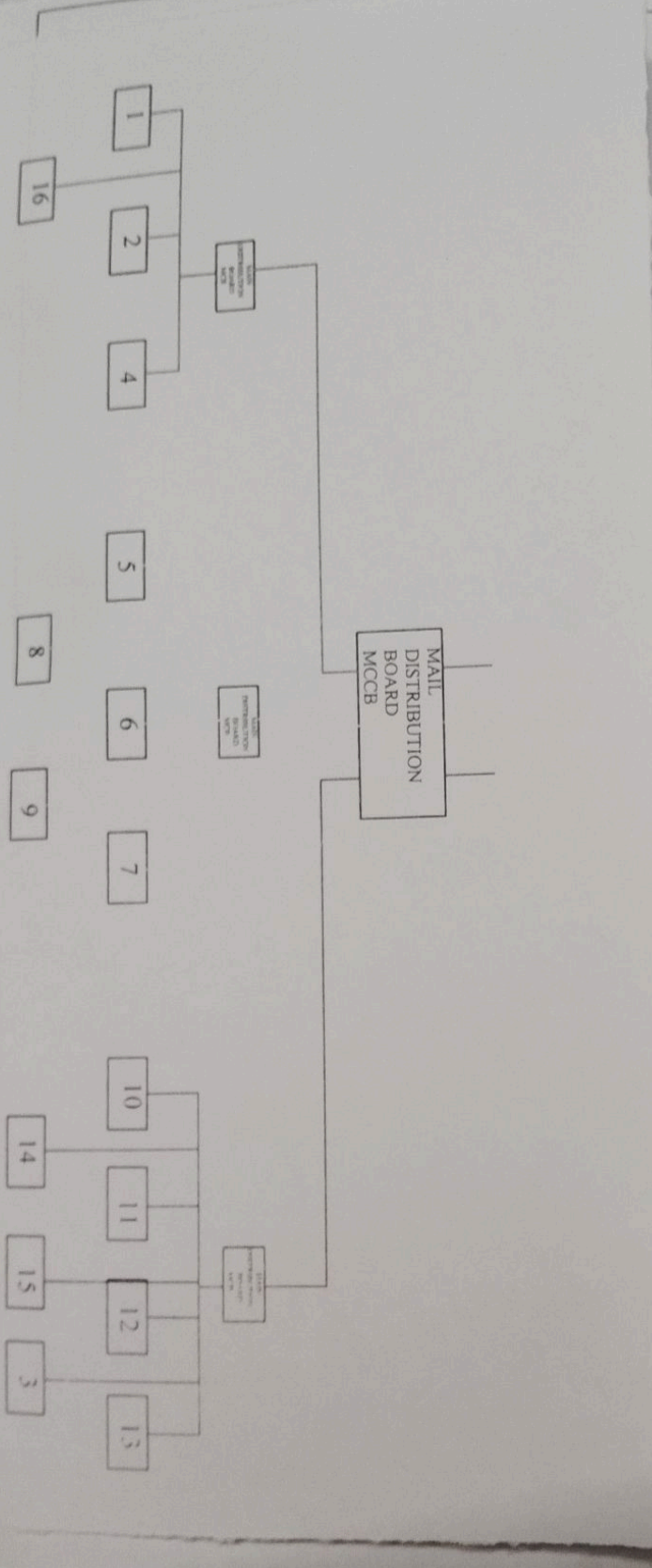
IV Practical Outcome

- Draw single line wiring diagram of above commercial installation.
- Draw the symbols of installation components on the above plan showing their location.
- Draw the installation wiring route diagram for the above plan.

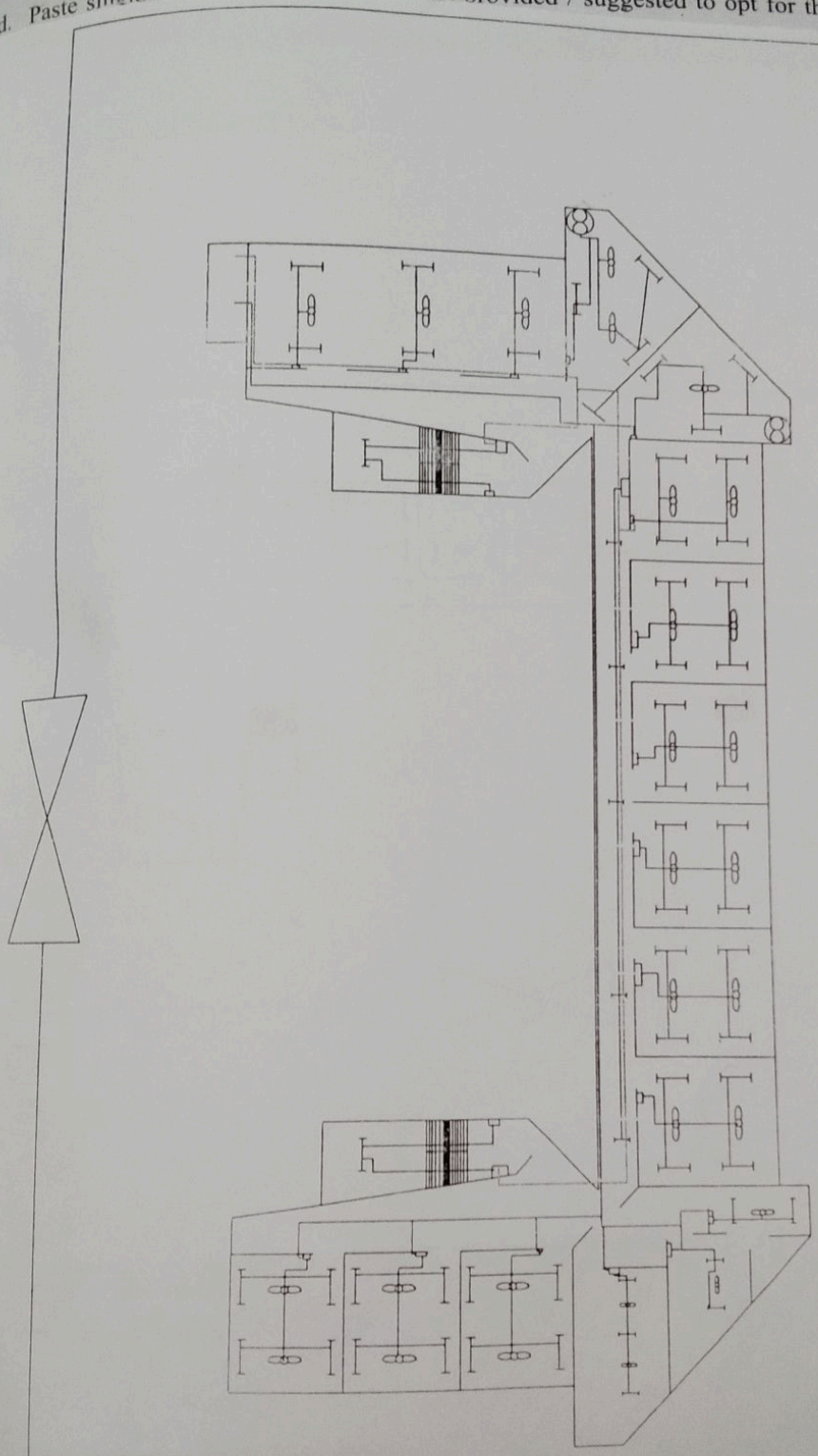
V Minimum Theoretical Background

- Meaning and purpose of symbols used to represent electrical equipment in given electrical installation system.
- Application and need of electrical accessories and protective devices based on type of installation.
- Determining the Size/Rating of distribution board, wires and protective equipment.
- IE rules pertaining to all type of electrical installation.
- Knowledge of Auto-cad.

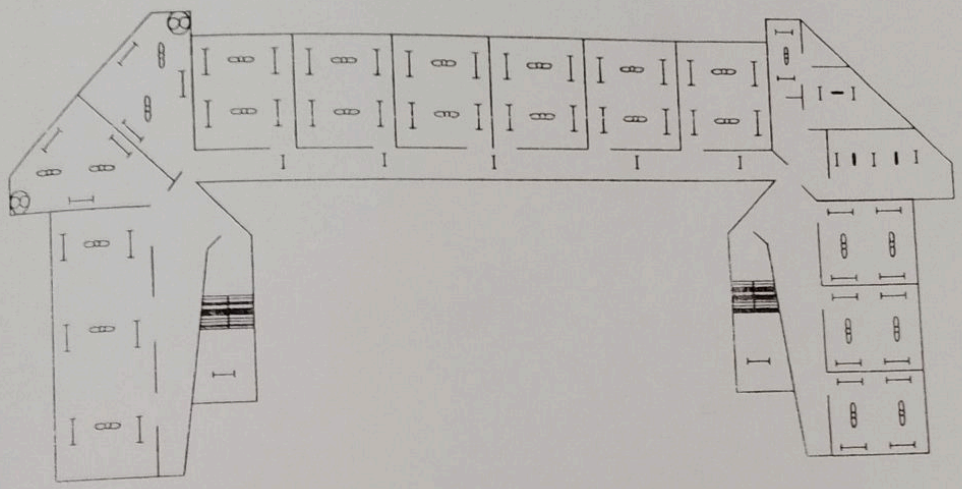
d. Paste single line wiring diagram for the provided / su... ed to opt for the small



d. Paste single line wiring diagram for the provided / suggested to opt for the small



d. Paste single line wiring diagram for the provided / suggested to opt for the small commercial unit using Auto-cad.



13, 14, 15	LABORATORY
16	VERANDAH

proper labeling.

4. Draw conduit route to join all the points with respective main distribution and sub-distribution board with shortest accessible route.
5. Mark the number of conductors in respective conduit.
6. Draw electrical wiring diagram based on plan drawn in step 4 and 5.

X **Resources Used**

Sr. No.	Name of Resource	Provided/ Suggested to opt for the Plan	Quantity
1	Auto-Cad soft tool		
2			

XI **Actual Procedure Followed** (use blank sheet if space is not sufficient)

①Collect plan & requirements of electrical points from client ②Draw the stated plan in auto-cad, clearly indicating doors, windows, etc ③Draw the appliances, D.B, power point by represent with symbols ④Draw conduit route to join all point with main D.B & Sub D.B ⑤Mark no. of conductors in respect conduit ⑥Draw electrical wiring diagram based on plan.

XII **Precautions Followed**

①Use standard symbols as per I.E rules to represent electrical installation accordingly ②Segregate wiring installation with suitable colour based on distribution outlets ③Clearly specify the position of points & distribution board with proper labelling ④Segregate power & lighting installation with seperate colour.

XIII **Assumption and Calculations (Made while determining/ deciding the size/rating of wire, conduit and RCCB/ MCCB/ MCB)** (should be as per IE rules and regulations)

(Use blank sheet if space is not sufficient)

DATE / /

Assumption

Hight of ceiling - 3 m

Main Board from Floor - 2 m

Switch Board from Floor - 1.5 m

Tubes from Floor - 3 m

Dimension -

Library - 14 x 6 x 3

Laboratory - 7 x 7 x 2 x 7 x 3

classroom - 7 x 5 x 3

staff room - 5 x 2 x 5

principle cabin - 5 x 3 x 3

office - 7 x 7 x 3

Laboratory - 5 x 5 x 3

varanda - 35 x 2 x 3

Wattage:

Tube - 40 W

Fan - 60 W

Exhaust fan - 30 W

5A Socket - 100 W

In all room there ps two 5A socket are provided except laboratory and office.

In laboratory these ps six 5A socket provided

Load calculation

Total no. of tubes - 62 x 40 = 2480 W

Total no. of fans - 29 x 60 = 1740 W

Total no. of 5A socket - 45 x 100 = 4500 W

Total no. of exhaust fan - 2 x 30 = 60 W

ed to opt

	Quantity

ient)

from client

ing dear.

int by

ain all point

to respe-

on plan

represent

ceiling

list of bu

points &

segregate

ver

g the size/rating

per IE rules and

16

Total load = 8780 W

load on each phase = 2926.66 W

Current

$P = \sqrt{3} V I \cos\phi$

$I = \frac{P}{\sqrt{3} V \cos\phi}$

$= \frac{8780}{\sqrt{3} \times 440 \times 0.9}$

$I = 12.008$ A

Excessive current = $I \times 2$

$= 12.008 \times 2$

$I_T = 25.6017$ A

Hence we require 32 A, 415 V SCTP for main board and also we require '4×4' cable for connection from meter board to main board.

And for other connection means power connection we require wire size of 1.5 sq. mm

Selection of MCB

For main board we require 32 A 4A MCB

* Load on library

Tube = 6×40 = 240 W

Fan = 3×60 = 180 W

5A Socket = 3×100 = 300 W

720 W

$I = \frac{P}{V} = \frac{720}{230} = 3.13$

Total current = 3.1304 × 1.5 = 4.6956 A

∴ We require 4A two pole MCB for library.

DATE / /

Load on laboratory -

Fan = 2×60 = 120 W

Tube = 3×40 = 120 W

Exhaust fan = 1×30 = 30 W

5A Socket = 2×100 = 200 W

470 W

$I = \frac{P}{V} = \frac{470}{230} = 2.0435$ A

$I_T = 2.0435 \times 1.5$

$= 3.0652$ A

∴ Hence for laboratory we require 3A two pole MCB

Load on classroom

Tube = 4×40 = 160 W

Fan = 2×60 = 120 W

5 A Socket = 2×100 = 200 W

480 W

$I = \frac{P}{V} = \frac{480}{230} = 2.0870$ A

$I_T = 2.0870 \times 1.5$

$= 3.130$ A

∴ Hence we require 3A, two pole MCB for classroom

Load on staff room and principle cabin

Tube = 4×40 = 160 W

Fan = 2×60 = 120 W

4 A Socket = 4×100 = 400 W

680 W

$I = \frac{P}{V} = \frac{680}{230} = 2.9563$ A

$I_T = 4.4358$ A

∴ Hence we require 4 A two pole MCB

load on office

Tube = 3×40 = 120 W

Fan = 2×60 = 120 W

5A Socket = 6×100 = 600 W

840 W

$I = \frac{P}{V} = \frac{840}{230} = 3.6522$ A

∴ Hence we require 6A two pole MCB.

Load on laboratory

Fan = 2×60 = 120 W

Tube = 4×40 = 160 W

5A Socket = 6×100 = 600 W

880 W

$I = \frac{P}{V} = \frac{880}{230} = 3.8$

$I_T = 5.739$ A

∴ Hence we require 6 A two pole MCB.

Load for Varanda -

Tube = 6×40 = 240 W

5A Socket = 2×100 = 200 W

440

$I = \frac{P}{V} = \frac{440}{230} = 1.94$

$I_T = 2.8696$ A

∴ Hence we require 3 A two pole MCB.

Requirement of conduit

For the main and sub circuit we use conduit for size 25.4 mm because in this connection there are maximum subcircuit 6 are used.

Total current

$I = 25.9002$ A

$I_T = 25 \times 2$

$= 51.8004$ A

So we will use 64 A MCB for supply incoming side.

DATE

= 3.826

= 1.9435

ese

s conne

used.

ding

DATE / /

Size of MCB

4 A , 2 P = 2 Nos

3 A , 2 P = 7 Nos

6 A , 2 P = 4 Nos

Size of wire

4.59 mm x 4 c cable for connection from meter board to main board.

For power unit we will use 1.5 mm^2 wire

Conduit

For all the connections we will use conduit of size 25.4 mm^2 because there are No. of wire are present

MCCB.

We will use MCCB for incoming of size 64 A four pole

XIV **Results (Comment on rating of protective devices and its need in given installation. Quote the relevant IS codes)**

To draw plan of electrical installation scheme for given small commercial unit using auto-cad

XV **Interpretation and Assumption (Made while drawing plan of the given electrical installation)** (As per IE rules and safety norms pertaining to commercial installation)

We understood the plan of electrical installation with their cost-estimation

XVI **Conclusions** (In relevance to the extent the practical outcomes were achieved after this practical)

We understood how to draw the symbol of installation components on the above plan showing their location

XVII **Practical Related Questions**

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO. (** Question is to be answered strictly)

1. Determined size and rating of wire, MCCB and RCCB. **
2. Write the significance of electrical symbols specifically used in commercial installation drawing.
3. Write IE rule pertaining to commercial installation system.
4. Describe the procedure to determine the size of backup or emergency supply.
5. Differentiate between electrical power duct and L.V duct.

[Space for answers]

Q-2- Ans:-

An electrical schematic daigram or ckt diagram is an drawing that shows the connection and components in an electrical ckt. It maked it easier to understand how to build a particular ckt.

It makes it easier to understand how to build a particular circuit we use these electrical symbols for components on the ckt diagram.

Q-3- Ans:-

- No of subckt be calculated first to know the total load of a plant.
- All accessories should be fixed on the ground blocks or boards with brass screw
- All the switches should be connected through live wire.
- Socket must have earth point
- If their are machines, motor, pump provide double earthing

Q-4- Ans:-

Procedure to determine the size of back up:-

① Read all warning before processing
② choose charger that can supply enough current to charge battery and keep up with inverter load
③ choose an inverter
④ Get cables & fuses & other hardware to incorrect batteries, charger & inverter

XVIII References

1. https://as
2. https://w ee.ht..
3. https://

⑤ Wear safety p
⑥ secure cycle b

Q-5- Ans:
① LV Dis from 12
② Electr means cables

Names
1. P
2. ...
3. ...
4. ...

D

Maharash

XVIII References / Suggestions for Further Reading

1. https://ask-the-electrician.com/wiringdiagrams.html
2. https://www.btechguru.com/courses--nptel--electrical-engineering-video-lecture--ee.ht..
3. http://www.electricaltechnology.org/2013/09/electrical-wiring.htm

Date : / /

⑤ Wear protective gear and observed safety precautions.

⑥ Security attach charger cables to deep cycle battery.

Q-5-Ans:-

① LV Ducts are used to transfer electricity from 132 kV system to low voltage system.

② Electrical power ducts is an alternative means of conducting electricity to power cables or cable points.

Names of Student Team Members

1. Pooja Vaje
2. .....
3. .....
4. .....

Marks Obtained			Dated signature of Teacher
Drawing Skill (10)	**Understanding (15)**	**Total (25)**	

Practical No. 3 : Draw plan of electrical installation scheme for given small factory / industrial unit using Auto-cad.

I Practical Significance

Every diploma electrical engineer must have the knowledge of Auto-cad for making the drawing of Small factory/ Industrial electrical installations and identify the symbolic representation of appliances/equipment, starter, main and sub- distribution board and their position / location as per IE rules. The safety norms and PPE's to be known while carrying out installation work in industrial electrical system.

Relevant Program Outcomes (POs)

- **Discipline knowledge:** Apply Electrical Engineering knowledge to solve broad-based Electrical Engineering related problems.
- **Environment and sustainability:** Apply Electrical engineering solutions to sustainable development practices in societal and environmental contexts.
- **Engineering tools:** Apply relevant Electrical technologies and tools with an understanding of the limitations.
- **The engineer and society:** Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in the field of Electrical engineering.
- **Ethics:** Apply ethical principles for commitment to professional ethics responsibilities and norms of the practice in the field of electrical engineering.
- **Communication:** Communicate effectively in oral and written form.

II Competency and Skills

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Plan electrical installations with their cost estimates.**

III Relevant Course Outcome(s)

- Interpret various electrical diagrams.
- Prepare estimate of industrial electrical installations.

IV Practical Outcome

- Draw single line wiring diagram of above industrial installation.
- Draw the symbols of installation components, starter and motor on the above plan showing their location.
- Draw the installation wiring route diagram for the above plan.

V Minimum Theoretical Background

- Meaning and purpose of symbols used to represent electrical equipment in given electrical installation system.

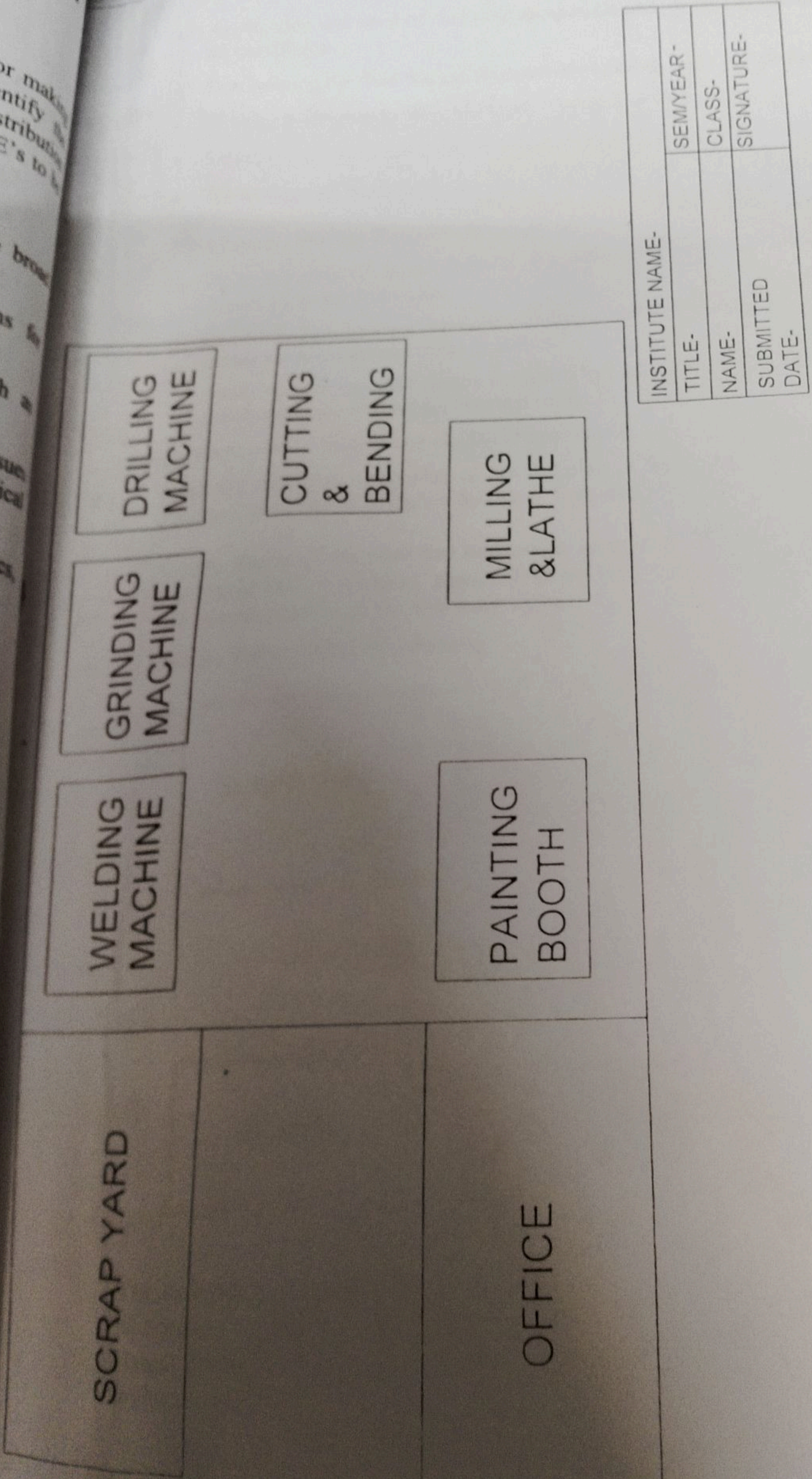
DRILLING MACHINE

CUTTING

GRINDING MACHINE

WELDING MACHINE

SCRAP YARD



based on type

ve equipment.

oad.

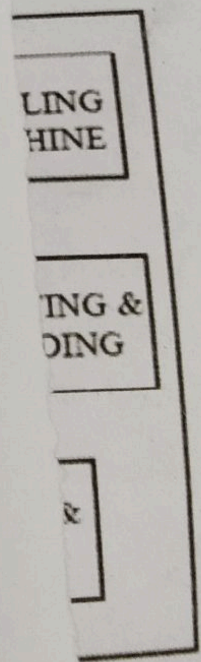
an has to be

its, starter and

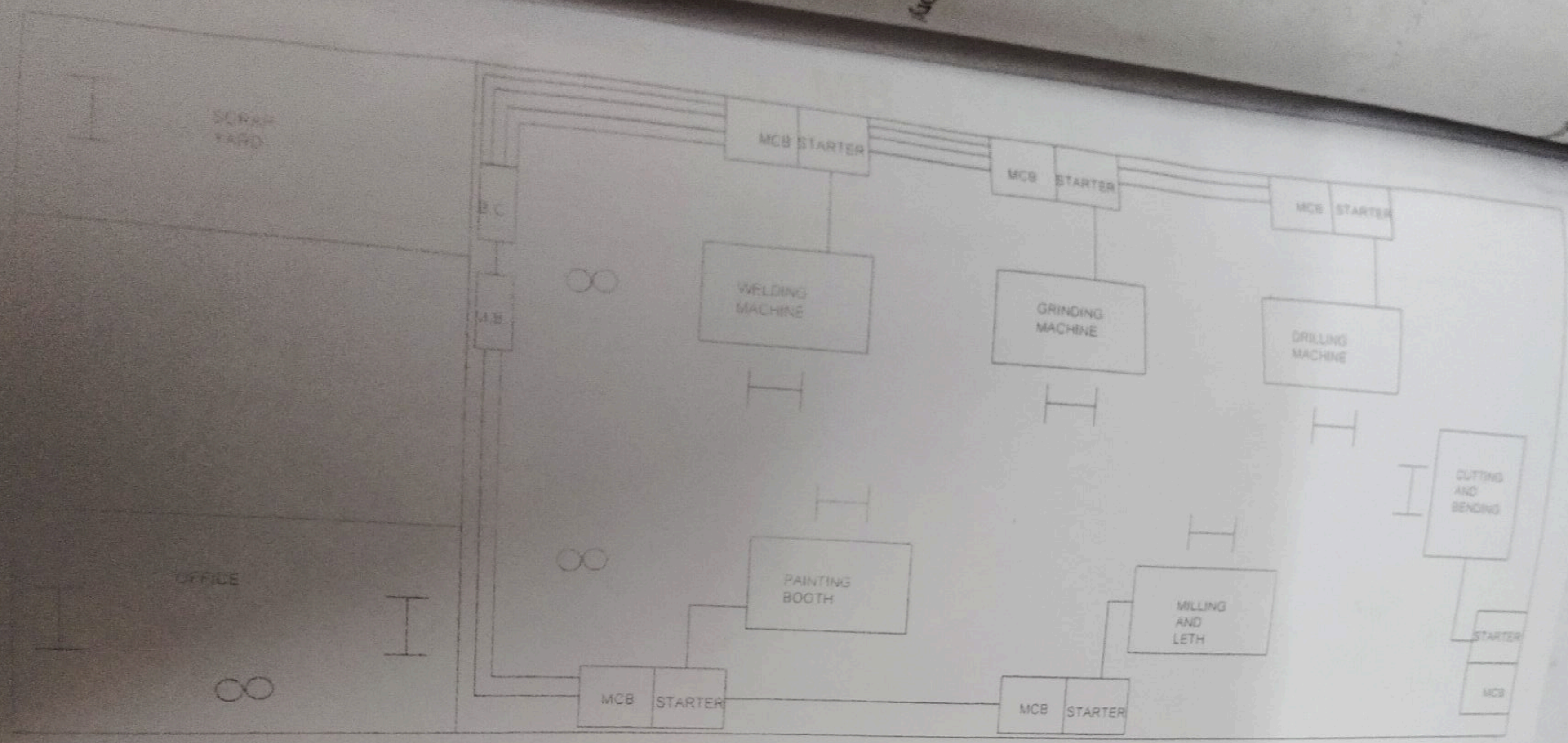
ith respective

al unit whose

ndustrial unit
pective group.



r protective
n. Draw the
, safety and

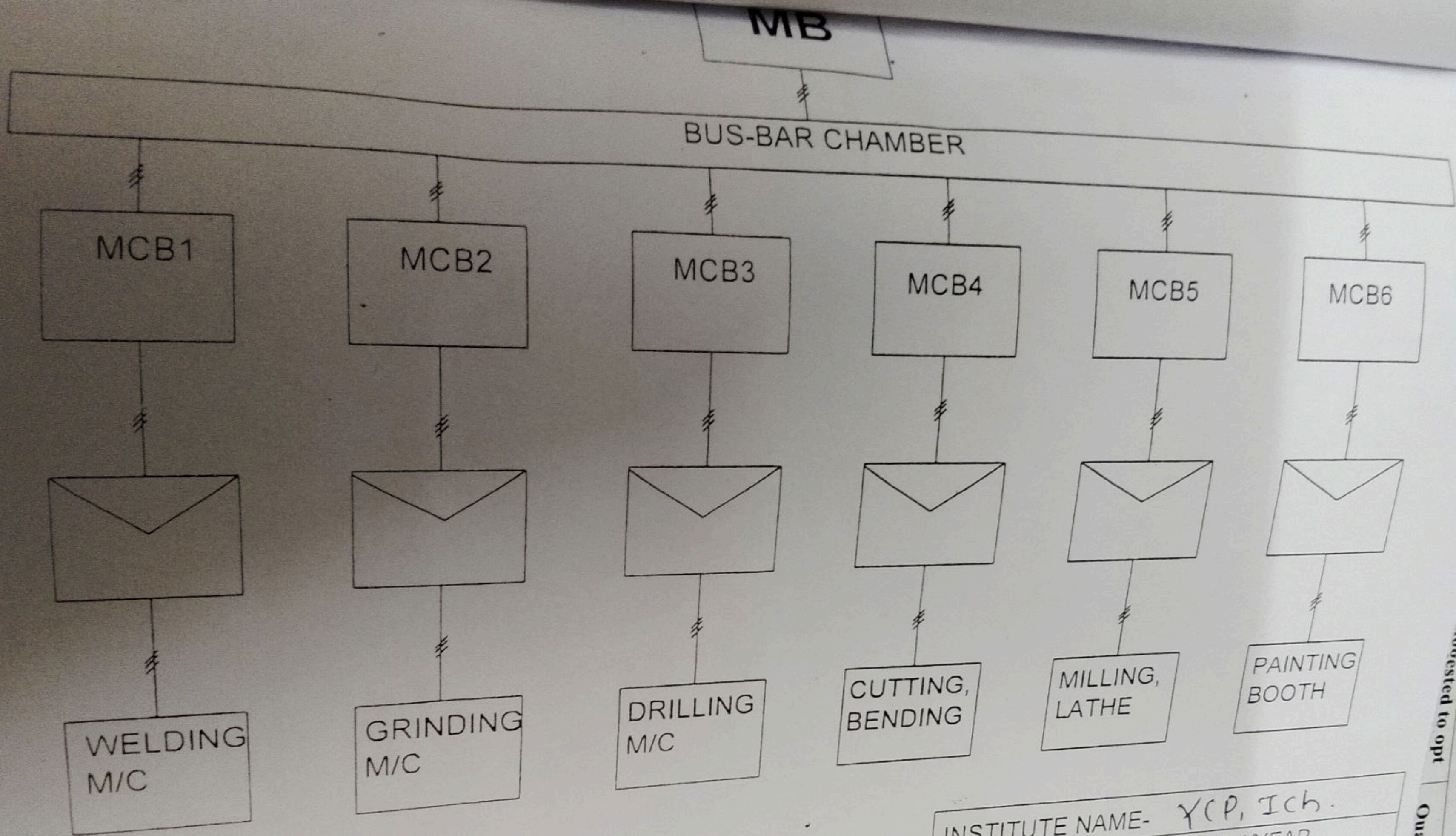


INSTITUTE NAME- YCP, Ich.

TITLE- Bus-Bar chamber SEM/YEAR-

NAME- Rachana Ingavale CLASS- TY

SUBMITTED DATE- SIGN.-



INSTITUTE NAME- YCP, Ich.	
TITLE- Bus-Bar chamber	SEM/YEAR-
NAME- Rachana Ingavale	CLASS- TY
SUBMITTED DATE-	SIGN.-

XI Actual Procedure Followed (use blank sheet if space is not sufficient)

① Collect the plan of arrangement of electrical point ② client ③ Draw the plan on auto cad, clearly indicating position of doors, window, etc ④ Draw the appliances D.B, power points, light, paint with symbols of color coding ⑤ Draw conduit route to fan all points with distribution of Sub D.B ⑥ Mark no. of conductor on conduit

XII Precautions Followed

① Use standard symbols as per I.E rule to represent the electrical installation
② Segregate wiring installation with proper colour based on distribution outlets
③ Use ferrules to label terminals of cable / wire

XIII Assumption and Calculations (Deciding the size/rating of MCCB, Distribution board and Protective relay)

(Use blank sheet if space is not sufficient)

- Plan A - Fabrication workshop

Tube = $10 \times 60\ W = 600\ W$

Fan = $1 \times 60\ W = 60\ W$

$660\ W$

$\therefore I = \frac{P}{V} = \frac{660}{230} = 2.86\ A$

$\therefore I = 2.86 \times 1.5 = 4.29\ A$

$\therefore$ For this MCB of rating 6A is used

2) Power load

i) Welding machine

$5\ KVA = 5 \times \cos\theta = 5 \times 0.8$

$= 4000\ W$

$I = \frac{4000}{230} = 17.40\ A$

$I = 17.40 \times 2$

$I = 34.78\ A$

For this machine 64 A MCB is used.

ii) Grinding Machine

2.5 HP = 25 × 735.5 = 1838.75 W

$$I = \frac{1838.75}{230}$$

$I = 8$ A

$I = 8 \times 2$

$I = 16$ A

For this machine 16 A MCB is used.

iii) Drilling Machine

2 HP = 2 × 735.5 = 1471 W

$$I = \frac{1471}{230}$$

$I = 6.39$ A

$I = 6.39 \times 2$

$I = 12.78$ A

For this 16 A MCB is used.

iv) Cutting and bending Machine

5 HP = 3677.5 W

$$I = \frac{3677.5}{240}$$

$I = 8.35$ A

$I = 8.35 \times 2$

$I = 16.7$ A

For this machine 32 A MCB is used

v) Miling and lathe

5 HP = 3677.5 W

$I = \frac{3677.5}{440}$

$I = 8.35$

$I = 8.35 \times 2$

$I = 16.7$ A

For this 32 A MCB is used.

iv> Painting Machine / Booth

1 HP = 735.5 W

$I = \frac{735.5}{230}$

$I = 3.19$

$I = 3.19 \times 2$

$I = 6.38$ A

For this 6.38 A MCB is used

For plan A total current 90.3 A. So that 100 A MCCB is used.

Plan B - Total Making workshop.

i> Light load

Tube = $9 \times 60 = 540$ W

Fan = $1 \times 60 = 60$ W

600 W

$I = \frac{600}{230} = 2.60 \times 1.5$

For this 6A MCB used.

2> Power load

i> For 1, 2 and 3 machine

5 HP = 3677.5 W

$I = \frac{3677.5}{440}$

I = 8.35

I = 8.35 × 2

I = 16.7 A

For 3ϕ 32 A MCB ps used

4 & 5 Machine

10 HP = 735.5 × 10

= 7355

$I = \frac{7355}{440}$

I = 16.71 × 2 = 33.42 A

For 3ϕ 64 A MCB ps used.

ii) For 6 Machine

2.5 HP = 2.5 × 735.5

= 1838.75 W

$I = \frac{1838.75}{440}$

I = 4.17 A

I = 4.17 × 2

I = 8.34 A

For 3ϕ 16 A MCB ps used

Total current of plan B ps 62.36 A & 64 A MCCB ps used

Plan C - Flour & chilli grinding machine

i) lighting load.

Tube = 5 × 60 = 300 W

Fan = 1 × 60 = 60 W

360 W

$I = \frac{360}{230} = 1.36\ A$

$I = 1.36 \times 1.5$

$I = 2.34$

For 1Ps 5 A MCB Ps used

2) Power load

5 HP = 3677.5 W

$I = \frac{3677.5}{440}$

$= 8.36\ A$

$I = 8.36 \times 2$

$I = 16.72\ A$

For 1Ps 24 A MCB Ps used.

For plan C 64 A MCCB Ps used used.

XV **Results (Comment on selection of starter and type of protection. State the relevant IS codes)**

Draw plan of electrical installation scheme for given small factory layout using auto-cad.

XV **Interpretation and Assumptions (While drawing the plan of given electrical installation)** (As per IE rules and safety norms pertaining to commercial installation)

We draw the symbols of installation components, starter & motor on the above plan showing their location.

XVI **Conclusions** (In relevance to deciding the position of appliances and selection of shortest wiring route and its impact on costing)

We understood the how to plan of electrical installation scheme for given small factory.

XVII **Practical Related Questions**

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO. (** Question is to be answered strictly)

1. Determined rating of starter and relay and suggest its type for the given plan. **
2. State the different protective systems used in industrial installation with their specific applications.
3. Write IE rule pertaining to industrial installation system.
4. Differentiate between commercial and industrial installation.

[Space for answers]

Q.1 to 3 Ans :-

① As per Indian Electricity Act IE : 1956

② Conventional symbol

③ Materials as per standard specification.

④ Layout wiring should have seperate ckt

⑤ Workmanship exercised in supervision of certified expert authority

⑥ Drawing giving diagram be prepared & approved by expert engineers

⑦ Conductors - Cu or aluminium

Q-1-Ans:-

Name / size	Rating	Fault vtg. starting
3	90	25
4	135	40

Q-2-Ans:- Protection system:-

① Generator sets

② Overload & back up for distance

③ Earth fault / ground fault

④ Back up protection system

Generator set specification

Fuel tank capacity - 200, No of batteries 2, 125 KVA rating, 100 rated KW, & 174 A rated current

Q-4-Ans:- Commercial refers to any business venture done with the sole motive of gaining the word 'industrial' used for any business which involves the manufacturing of goods

Practical No. 4 : Draw plan of electrical installation scheme for given HT (11kV) connection using Auto-cad.

I Practical Significance

Every diploma electrical engineer must be well aware of the various component of Hv installation system with their location and application, this helps him to prepare plan layout drawing of given HV installation. He can execute the work at utmost care ensuing the IE rules and safety norms.

Relevant Program Outcomes (POs)

- **Discipline knowledge:** Apply Electrical Engineering knowledge to solve broad based Electrical Engineering related problems.
- **Environment and sustainability:** Apply Electrical engineering solutions for sustainable development practices in societal and environmental contexts.
- **Engineering tools:** Apply relevant Electrical technologies and tools with an understanding of the limitations.
- **The engineer and society:** Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in the field of Electrical engineering.
- **Ethics:** Apply ethical principles for commitment to professional ethics responsibilities and norms of the practice in the field of electrical engineering.
- **Communication:** Communicate effectively in oral and written form.

II Competency and Skills

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Plan electrical installations with their cost estimates.**

III Relevant Course Outcome(s)

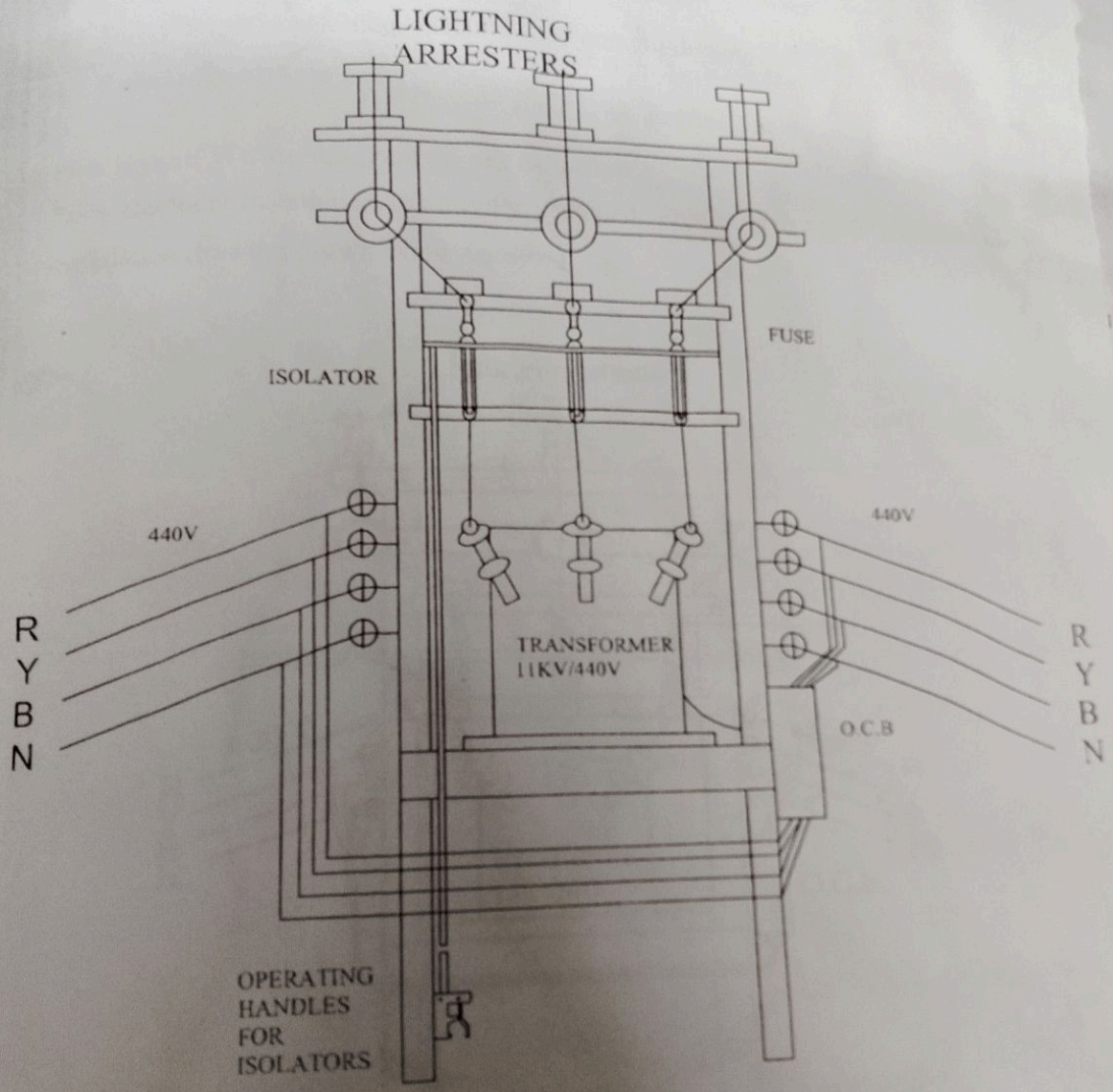
- Interpret various electrical diagrams.
- Prepare estimate of overhead and underground distribution lines (HT Lines)

IV Practical Outcome

- Draw single line wiring diagram of below HT (11kV) installation.
- Draw the symbols of installation components along with equipements (i.e. Transformer, CT, PT and ACB) on the below plan showing their location.
- Draw the installation wiring route diagram for the below plan.

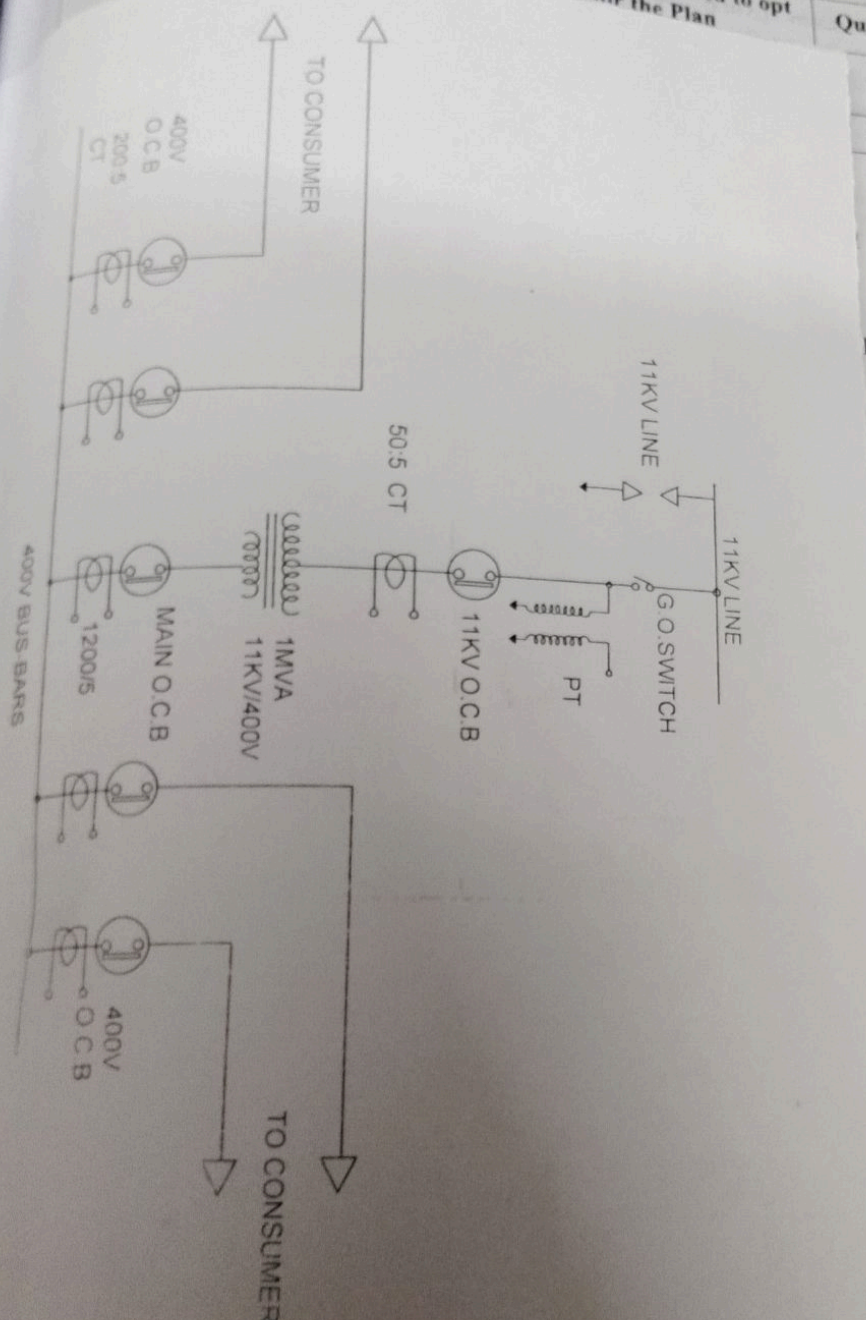
Minimum Theoretical Background

- Meaning and purpose of symbols used to represent electrical equipment in given



Resources Required

Sr. No.	Name of Resource	Provided/ Suggested to opt for the Plan	Quantity
1	Client/ HT In[illegible]		1



installation

les

ıtractor/ civil

former, cable
symbols.

Quantity
1

tation from client
sing auto-cad
resenting the
all accessories
location with standard symbols ④ specify
with protective equipment with standard symbols ④ specify
the clearance clearly where ever it is essential. ⑤ use
colour labelling to make drawing easy to understand.

VII **Resources Required**

Sr. No.	Name of Resource	Provided/ Suggested to opt for the Plan	Quantity
1	Client/ HT Installation plan from Industry/Commercial	HT installation scheme (Indoor / Outdoor)	1
2	Auto-cad soft tool	------	-----

Precautions to be followed:

1. Use standard symbols as per IE rule to represent the electrical installation accordingly.
2. Use ferrules to labelling the terminals of the cable/ wires.
3. Specify proper clearance/ distance between the equipment as per IE rules
4. Follows safety rule/ norms pertaining to industrial installation.
5. Use sign boards/ safety symbols.

Procedure

1. Collect the plan and requirement of H.T station from the client/ contractor/ civil consultant/ as suggested by staff member.
2. Draw the provided/ suggested to opt for plan using auto-cad.
3. Draw the layout of HV installation representing the location of transformer, cable route and all the accessories with protective equipment with standard symbols.
4. Specify the clearance clearly where ever it is essential.
5. Use colour labelling to make the drawing easy to understand.

Resources Used

Sr. No.	Name of Resource	Provided/ Suggested to opt for the Plan	Quantity
1	Auto-Cad Soft tool	–	1
2			

XI **Actual Procedure Followed** (use blank sheet if space is not sufficient)

Collect the plan and requirement of H.T. station from client draw the provided to opt for plan using auto-cad draw the layout of HV installation representing the location of transformer, cable route and all accessories with protective equipment with standard symbols ④ Specify the clearance clearly where ever it is essential. ⑤ Use colour labelling to make drawing easy to understand.

XII Precautions Followed

1. Use symbols as per IE rule to represent the electrical installation accordingly
2. Use ferrules to labelling the terminals of cable
3. Specify proper clearance between equipments as per IE rules

XIII Assumption and Calculations (Deciding the size/rating CT, PT, Distribution board)

(Use blank sheet if space is not sufficient)

Sr. No.	Material	Quantity	Cost per each	Total cost
1.	Go Switch	1	5000	5000
2.	L.A.	1	2000	2000
3.	P.T.	1	6,50,000	6,50,000
4.	11 kV OCB	1	57000	57000
5.	400 V OCB	5	2000	10,000
6.	CT 50:5	1	13000	13000
7.	CT 1200/5	1	907	907
8.	CT 200/5	4	400	1600
9.	1 MVA 11 KV			

XIV Results (Comment on LA and Drop fuse selection criteria)

Draw plan of electrical installation scheme for given HT (11 KV) connecting using auto-cad

XV Interpretation and Assumptions (Made while deciding the position and location of electrical equipements according to IE rules)

We draw the symbols of installation components along with equipment

XVI Conclusions (Factors considered while selecting the location for substation)

We understood the how the plan of electrical installation scheme for given HT connection using auto-cad

XVII Practical Related Questions

***Note:** Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO. (** Question is to be answered strictly)*

1. Determined the rating of CT, PT and circuit breaker for 500 kVA, 11KV transformer. **
2. State IE rule pertaining to HV installation system.
3. Describe the procedure to determine the size of transformer and cable.
4. State the factors considered while selecting site for HT substation installation.
5. Describe the function of Lightning arrestor and drop fuse.
6. State specific requirements for Indoor and Outdoor substation.

[Space for answers]

Q-5- Ans:-

Lightning arrestor :- A LA is a device use electrical power system to avoid the damaging effects of lightning. The typical LA have high voltage terminal and a ground terminal.

Drapout fuse :- Drapout fuse are protection device that protect networks & equipment from current surge & overload.

The main function of drapout fuse is to protect transformer on distribution networks.

Q-6-Ans:- Indoor type substation:-
Such substation are usually for a Vtg upto 11 kV can be erected for the 33 kV & 66 kV when the surrounding atmosphere is contaminated by impurities such as metal fumes, conductive dust etc.

Q-4- Ans:-
i) Type of substation
ii) Availability suitable & sufficient
iii) Communication facility
iv) Atmospheric condition
v) Earth resistance

Q-2- Ans:-
① Higher illumination level require
② If points are more than 3 Φ supply can use
③ 1-Φ or 3-Φ load controlled seperately
④ According to IE rule 10 points or 800 W on sub-ckt, 200 W on one power sub-ckt
⑤ Lighting and power circuit be seperate

r given

equipment, uto-cad for be known

ve broad

ions for

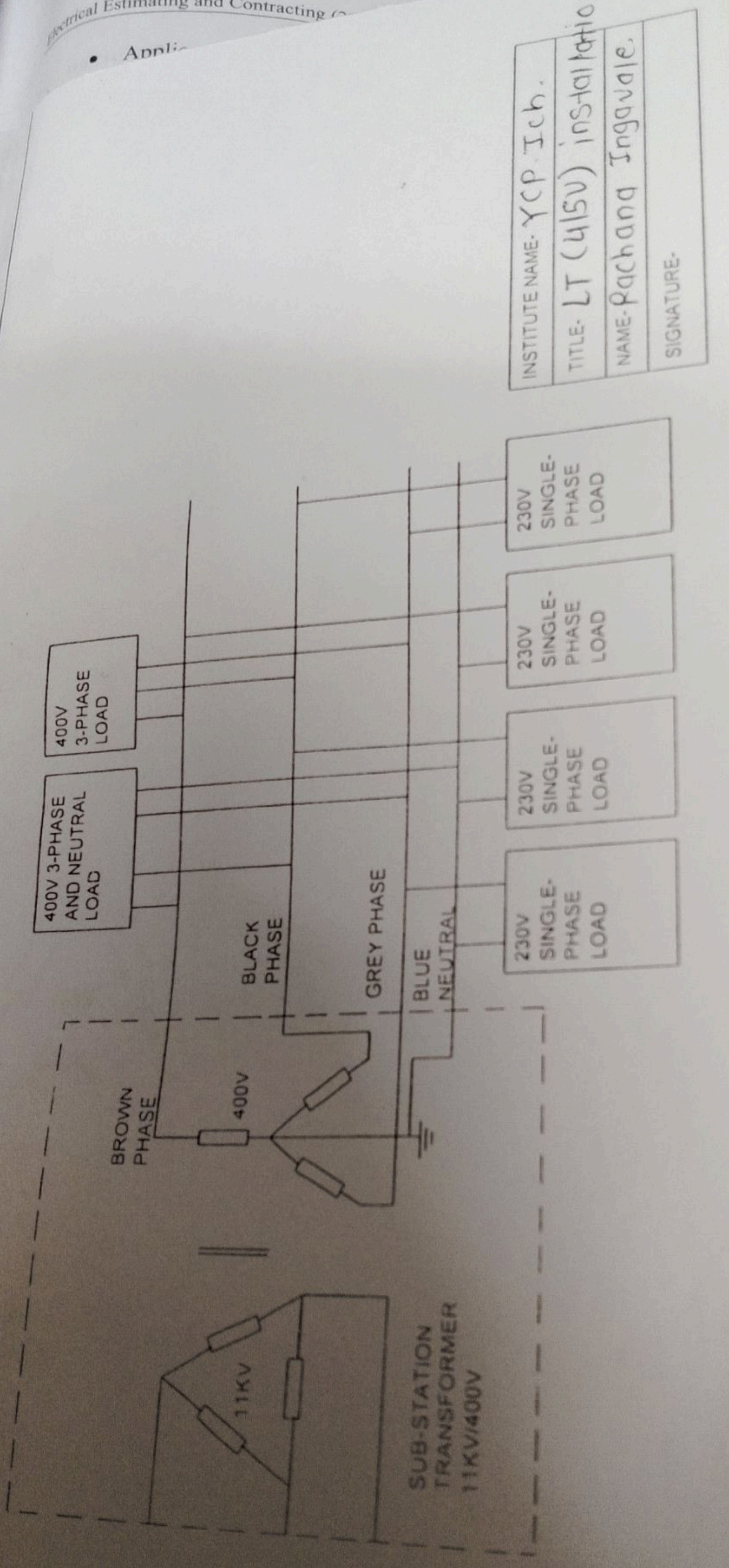
with an

issues ctrical

thics,

ied

• Appli...



ces based on type

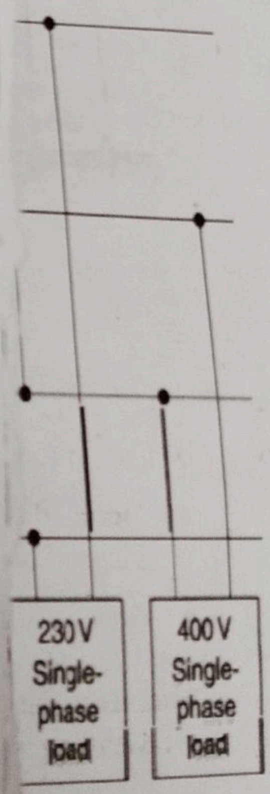
cting cables and

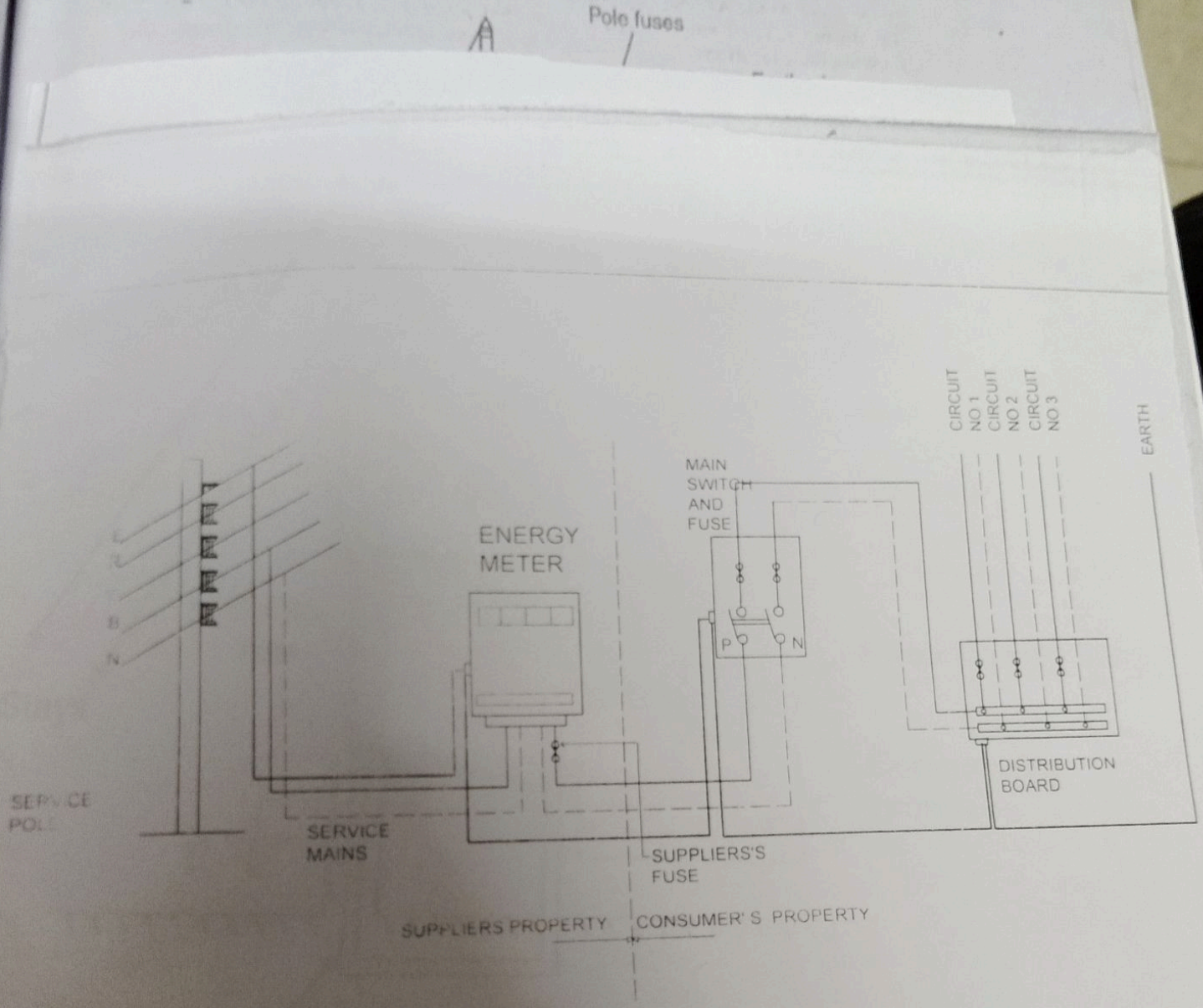
ed load on the

nents (i.e. Busbar,

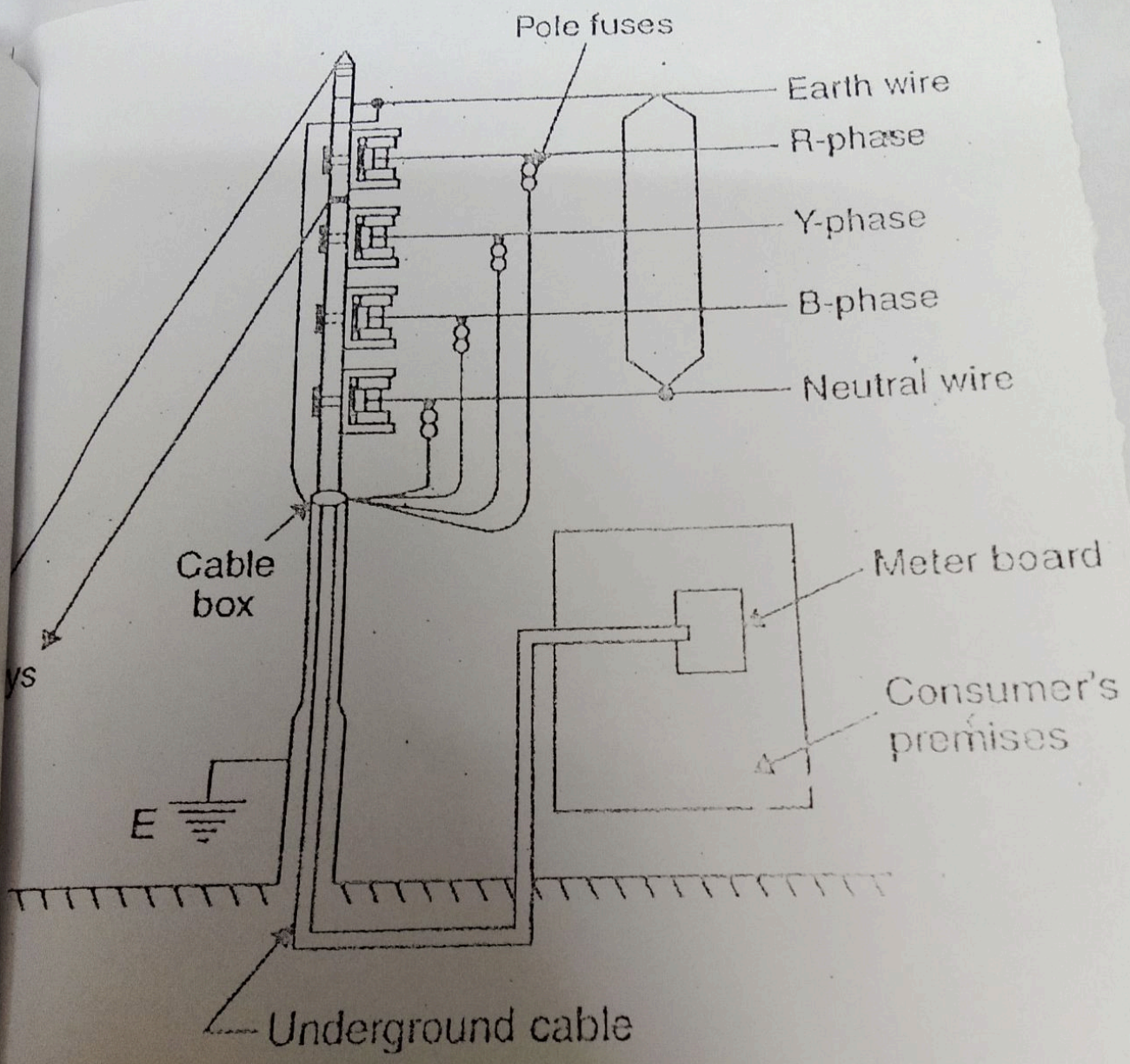
or the LT (415V)

e




Pole fuses
CIRCUIT NO 1
CIRCUIT NO 2
CIRCUIT NO 3
EARTH
MAIN SWITCH AND FUSE
ENERGY METER
P
N
DISTRIBUTION BOARD
SERVICE MAINS
SUPPLIERS'S FUSE
SUPPLIERS PROPERTY
CONSUMER' S PROPERTY

Pole fuses


Pole fuses
Earth wire
R-phase
Y-phase
B-phase
Neutral wire
Cable box
Meter board
Consumer's premises
E
Underground cable

VII Resources Required

Sr. No.	Name of Resource	Provided/ Suggested to opt for the Plan	Quantity
1	Information from client/consumer	Selection of type of service connection	1
2	Auto-cad soft tool	-----	-----

VIII Precautions to be followed:

1. Use standard symbols as per IE rule to represent the electrical installation accordingly.
2. Segregate wiring installation with proper colour based on distribution outlets.
3. Clearly specify the position/location of points and distribution board with proper labeling.
4. Segregate power and lighting installation with separate colour.
5. Use ferrules to label the terminals of the cable/ wire.
6. The installation of electrical machine must match with sequence of operation and finishing of product.
7. Follows safety rule/ norms pertaining to industrial installation.

IX Procedure

1. Collect the information about connected load of the client/ consumer.
2. Choose size and rating of cable, distribution board and fuse.
3. Select shortest route to convey power from distribution pole/ terminal to consumer premises.
4. Based on locality and type of consumer select service connection.
5. Draw service connection diagram by using AutoCAD.

X Resources Used

Sr. No.	Name of Resource	Provided/ Suggested to opt for the Plan	Quantity
1	Auto-Cad Soft tool		1
2			

XI Actual Procedure Followed (use blank sheet if space is not sufficient)

① Collect the information about connected load of client ② Choose size and rating of cable, D.B & fuse ③ Choose shortest route to convey power from Distribution pole to consumer premises ④ Based on locality and type of consumer select service connection ⑤ Draw service connection diagram by using Auto-Cad.

XII Precautions Followed

① Use standard symbols as per IE rule to represent the electrical installation accordingly ② Segregate wiring installation with proper color based on distribution circuits ③ Segregate power and lighting installation with seperate colour ④ Use ferrules to label the terminals of cable.

XIII Assumption and Calculations (Made while selecting the materials and rating of protective equipements used in installation as per IE rules and regulations).

(Use blank sheet if space is not sufficient)

Sr No.	Specification	Quantity	Remark
1.	Fuse (15 Amp)	1	For pole
2.	Fuse (15 Amp)	1	For M.B
3.	PVC wire	–	–
4.	Stay set	2	–
5.	Insulators	–	–
6.	Cable head	1	–
7.	Screw	30	–
8.	Bend	3	–
9.	Coach Board	2	Main board
10.	Neutral link	1	–
11.	Metal board	1	–
12.	Pipe reducer	1	–
13.	Cable Box	1	–

XIV Results (Comment on CT ratio, MCB rating and state relevant IS codes)

We draw a plan of electric installation scheme for LT (415 V) line connection using CAD

XV Interpretation and Assumptions (While choosing the route and type of service connections)

We understood the single phase line diagram & schematic diagram of LT line connection

XVI Conclusions (In relevance to selecting the type of service mains, shortest laying route, size and rating of distribution etc.)

Also we estimate the LT line connection and understood the estimating costing

XVII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO. (** Question is to be answered strictly)

1. State the reason for selection of type of service main and rating of D.B. **
2. Describe the factors governing the selection of type of service connection.
3. Distinguished between underground and overhead service connection.
4. List the properties and important features of cable used for underground service connection.

[Space for answers]

Q-4- Ans:-

1. Conductor used in the cables is generally made up of standard Cu and Al

2. Cables is provided with proper thickness of insulation

3. High mechanical strength

features -

1. Smaller voltage drop
2. low chances of developing fault

Q-2- Ans :-

Selection factors of type of service connection :-

1. Heather proof cable used for service connection.
2. Size of cable depends upon consumer load requirement

Q-3- Ans :-

Overhead System	Underground system
① It is less safe	① More safe
② Less expensive	② More expensive
③ It can be easily repaired.	③ It cannot be easily repaired.
④ More chances of accidents	④ Less chances of accidents

Practical ... premises using ...

I **Practical Significance**

Every diploma electrical engineer must have the knowledge about the significance of public lighting scheme. The knowledge of Auto-cad for making drawing of given public lighting installations by using standard symbol to represent equipment, distribution board etc. and their position / location as per IE rules.

Relevant Program Outcomes (POs)

- **Discipline knowledge:** Apply Electrical Engineering knowledge to solve broad based Electrical Engineering related problems.
- **Environment and sustainability:** Apply Electrical engineering solutions for sustainable development practices in societal and environmental contexts.
- **Engineering tools:** Apply relevant Electrical technologies and tools with an understanding of the limitations.
- **The engineer and society:** Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in the field of Electrical engineering.
- **Ethics:** Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice in the field of electrical engineering.
- **Communication:** Communicate effectively in oral and written form.

II **Competency and Skills**

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Plan electrical installations with their cost estimates.**

III ***Relevant Course Outcome(s)***

- *Interpret various electrical diagrams.*
- *Prepare estimate of public lighting installations.*

IV ***Practical Outcome***

- *Draw plan showing location of street light stays and route of the cable.*
- *Draw actual wiring diagram of above street light installation.*

V **Minimum Theoretical Background**

- Meaning and purpose of symbols used to represent electrical equipment in given electrical installation system.

VII Resources Required

Sr. No.	Name of Resource	Quantity
1	Textbook/ A...	ghting 1
		----

electrical installation

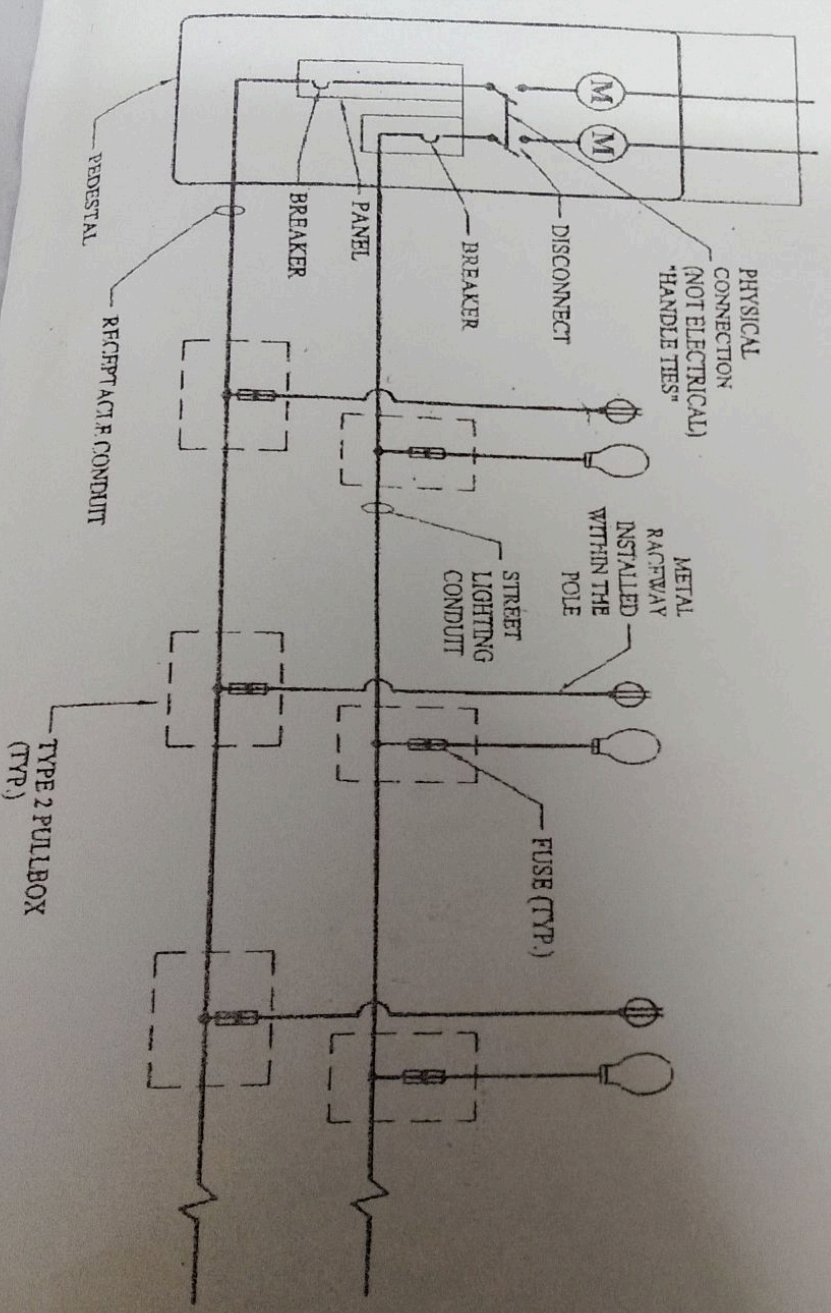
ibution outlets.
the pole, angle of

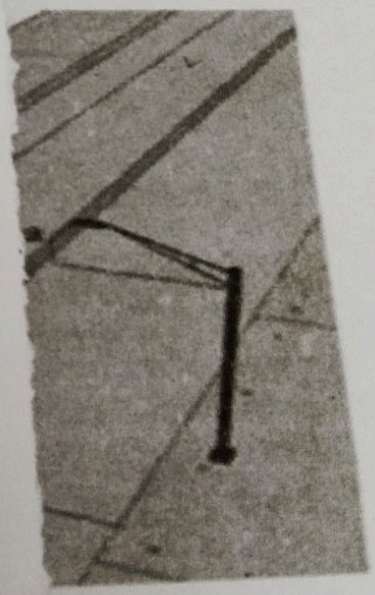
ation.
stallation.

ting.
ecessary information

he span and position

n most feasible and
rop of 5% is allowed
d.





Street Lighting Features (BIS 1981)

a: Angle of Tilt or: Outreach s: Spacing w: Width h: Mounting Height
o: Overhang

- Average Lumen of Lamp (Al)= (E x w x d) / CoU x mf
- Al= (6.46x7x50)/ (0.29×0.9) = 8662.83 Average lumen

Lamp lumen of a 250 watts lamp is 11,500 lm which is the nearest value to 8662.83 lumen. Therefore, a 250 watts lamp is acceptable.

Let's computing for the actual illumination E for 250Watt Lamp

- Illumination (E)= (Al x (cu x mf)) / (w x d)
- E= (11500×0.29×0.9) / (7×50) = 8.57 lumen per sq. meter.

Conclusion:

Actual illumination (E) for 250 Watt is 8.57lumen per sq. meter which is higher than recommended illumination (E) 6.46.

Hence 250 watt gives adequately lighting.

2. Calculate Spacing between two Light Poles (Lamppost):

- Calculate Space between Two Pole of Street Light having Fixture Watt is 250W , Lamp output of the Lamp (LL) is 33200 lumens , Required Lux Level (E) is 5 lux , Width of the road = 11.48 feet (3.5 M),Height of the pole (H) = 26.24 feet (8 M) ,Coefficient of utilization (CoU) = 0.18, Lamp Lumen Depreciation Factor (LLD) = 0.8 ,Luminaries dirt Depreciation Factor (LDD) = 0.9

Solution:

- Luminaries Spacing (S) = (LL x CoU x LLD x LDD) / (E x W)
- Luminaries Spacing (S) = (33200×0.18×0.9×0.8) / (5×11.48)
- Luminaries Spacing (S) = 75 feet (23 Meters)

X Resources Used

Sr. No.	Name of Resource	Suggested Plan	Quantity
1	Auto- Cad	-	+
2			

XI Actual Procedure Followed (use blank sheet if space is not sufficient)

① Calculate the number of lamppost required for given road lighting ② follow the sample procedure given below to determine the necessary information to design street lighting ③ Draw lighting scheme by using auto-cad, clearly indicating the span and position of lamppost ④ show the position of distribution board

XII Precautions Followed

① Use standard symbols as per IE rules to represent the electrical installation accordingly.

② Segregate wiring installation with proper colours based on distribution outlets.

XIII Assumption and Calculations (Spacing between lamppost, height of pole & rating of lamp).

(Use blank sheet if space is not sufficient)

Assumption :-

- Length of road - 200 m
- No. of lamp post - 50 Nos
- Distance between two lamppost - 40 m
- Width of roadway - 7 m
- M.F - 0.9
- Coefficient of utilization - 0.29
- Recommended Illumination - 6.46 m^2

• Average lumen of lamp (AL) -

$$= (E \times W \times d) / (Cu \times mf)$$

$$= \frac{(6.46 \times 7 \times 50)}{(0.29 \times 0.9)}$$

$$= 6962.83 \text{ Average lumen}$$

Lamp lumen of 95 W Fluroscent lamp is 7500 m which is the nearest value to 6962.83 lumen therefore 95 W lamp is acceptable

$$\text{Illumination } (E) = \frac{(AL \times Cu \times mf)}{(W \times d)}$$

$$= \frac{(7500 \times 0.29 \times 0.9)}{(7 \times 40)}$$

E = 6.99 lumens / m2

• spacing between lamppost is 40 m

• Height of pole = 8 m

• Rating of lamp = 230 V, 95 W
Fluorescent tube

DATE / /

XVII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. List out the illumination level required for different public lighting scheme.
2. Write IE rule pertaining to above electrical installation system.
3. Differentiate between Flood lighting and Road lighting.
4. Discuss the factors consider while installation of lighting in tunnels.

[Space for answers]

Q-1- Ans :-

Name of public place	Required illumination
1. Stairways	410 lux
2. Police way	1010 lux
3. Cross roads	341 lux
4. Parking lots	2210 lux

DATE

XIV **Results (Importance of public lighting scheme. Relevant IS code)**

We draw the plan of showing location of street light stays and route of cable

XV **Interpretation and Assumptions (While planning for electrical installation for street lighting in given practical)**

We understand have to draw plan of street light and its location

XVI **Conclusions (Selection of level of illumination based on traffic density and type of the road)**

This practical will helps us to feature for estimating these street light

XVII **Practical Related Questions**

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. List out the illumination level required for different public lighting scheme.
2. Write IE rule pertaining to above electrical installation system.
3. Differentiate between Flood lighting and Road lighting.
4. Discuss the factors consider while installation of lighting in tunnels.

[Space for answers]

Q-1- Ans :-

Name of public place	Required illumination
1. Stairways	460 lux
2. Bpice way	1010 lux
3. Cross walks	341 lux
4. Parking lots	2210 lux

5. Bus stop / public facilities	251 lux

Q-2 - Ans :-

- Street light Features (BIS 1987)
- IES standard practice for Railway lighting RP - 8,200

Q-3 - Ans :-

Flood lighting	Road lighting
① In flood lighting aiming direction with respect to the intensity axis	① In road lighting aming at a particular direction on the road surface
② It covers wide range surface area	② It covers less surface area
③ Used on building hoarding, etc	③ Used on street light purpose

Q-4 - Ans :-

- On entering the lighting on the first part of the tunnel must be related to the adaption state of eye
- Luminance should be quite adequate for a darks adopted eye at night inside the tunnel
- The luminance should be so arranged that subsequent transition from the highest to lowest luminance level is made gradually in order to give the eyes time to adequate

Practical No.7 : Prepare tender documents, quotations and bills for specified work.

I Practical Significance

Every diploma electrical engineer must have the knowledge to prepare tender documents, quotations and bills for any specified work based on locality of installation. The student gain the idea of application and costing of main, auxiliary, protective, energy efficient equipment required to carry out the installation.

Relevant Program Outcomes (POs)

- **Discipline knowledge:** Apply Electrical Engineering knowledge to solve broad based Electrical Engineering related problems.
- **Environment and sustainability:** Apply Electrical engineering solutions for sustainable development practices in societal and environmental contexts.
- **Engineering tools:** Apply relevant Electrical technologies and tools with an understanding of the limitations.
- **The engineer and society:** Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in the field of Electrical engineering.
- **Ethics:** Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice in the field of electrical engineering.
- **Communication:** Communicate effectively in oral and written form.

II Competency and Skills

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Plan electrical installations with their cost estimates.**

III Relevant Course Outcome(s)

- Prepare tender, quotation and other related documents.

IV Practical Outcome

- Prepare tender documents, quotations, and bills for specified work.

V Minimum Theoretical Background

- Meaning and purpose of symbols used to represent electrical equipment in given electrical installation system.
- Application and need of electrical accessories and protective devices based on type of installation.
- IE rules pertaining to all type of electrical installation.
- Knowledge of estimation & costing as per current market rates.
- Comparative knowledge of various electrical product of different manufactures in relevance to technical, economical and service aspects.

VIJAYSHRI EQUIPMENTS

PLOT NO.8.,NEAR AMIT PROCESS,
P.O.GANGANAGAR ,
ICHALKARANJI 416 144 (MAHARASHTRA)

Quotation for:

Name: Work for supply, Erection, Testing & Commission of 33/11KV S/stn for providing HT supply to super specialty Hospital, Gandhi chowk, Latur.

Company Name: MAHAVITARAN (Maharashtra state Electricity Distribution Co. Ltd.)

Street address: Sale Galli, Hatte Nager, Latur, Maharashtra, 413512 India. **Phone:** 1800 233 3435

Date: 20/01/2020
QUOTATION # 01

QUOTATION Valid Until : 20/06/2020

Prepared By: Miss. Rachana Pramod Ingavale.

C.1	40 mm dia., 3000 mm long GI pipe earth electrode with test link, RCC pit, RCC cover plates on GI frame, bentonite powder and other accessories complete	Set.	1	1750.00	2012.50	10.00	175.00	175.00	2012.50	2187.50
C.2	GI Earthing spike made of 20mm solid Rod	No.	4	790.00	908.50	10.00	79.00	316.00	3634.00	3950.00
C.3	8 SWG GI wire, GI nuts, bolts & washers for earthing and guarding	Kg.	8	58.00	66.70	10.00	5.80	46.40	533.60	580.01
D	Conductor ACSR 120/20	Kg.	19	128.00	147.20	10.00	12.80	243.20	2796.80	3040.00
E	Insulator									
E.1	Strain type	No.	27	689.00	792.35	10.00	68.90	1860.30	21393.45	23253.75
E2	Pin Type	NO.	27	70.00	80.50	10.00	7.00	189.00	2173.50	2362.50
F	Lightining arrestor	No.	4	550.00	632.50	10.00	55.00	220.00	2530.00	2750.00
G	Cross arm SMC 75*40*7.3 mm	Unit	10	500.00	575.00	10.00	50.00	500.00	5750.00	6250.00
H	Danger plate	No.	10	120.00	138.00	5.00	6.00	60.00	1380.00	1440.00
	TOTAL									***81613.76***
	20% worker Charges									***16322.75***
	10% variable charges									***9801.07***
	Cost of installation									***107811.83***

Sr. No	Description	Unit	Qty	P&D approved rate for the period 20.1.2020 to 20.6.2020 or latest PO rate issued by P&D (In Rs.)	Cost of per unit for Supply of material including 15% overhead charges on P&D rate (In Rs.)	Rate of Erection Charges (in %)	Unit Erection Charges (In Rs)	Estimated cost for Erection (In Rs)	Estimated cost for Supply of material including 15% overhead charges (In Rs)	Total Estimated cost for supply and erection (In Rs)
1	2	3	4	5	6	7	8	9	10	11
A	PCC Pole 09 mtr. long	No.	10	2100.00	2415.00	15.00	315.00	3150.00	24150.00	27300.00
B	Galvanised Stay Set with anchor plate (200x200x6mm), 50x8mm stay clamp, Stay guy insulator, nut bolts, 2 Nos turn buckles, 1.8 m long, 16 mm diameter solid GS Stay rod & 7/3.15 mm Dia GI stranded wire etc as required as per technical specification, approved drawings and scope of work.	NO.	4	1700.00	1955.00	10.00	170.00	680.00	7820.00	8500.00
C	Earthing as per approved drawings, technical specifications and scope of work									

Resources Required

Sr. No.	Name of Resource	Suggested Plan	Quantity
1	Newspaper/ Online/ Electrical Contractor	Prepare tender documents, quotation and bills with consultation with electrical contractor	1

II Precautions to be followed:

1. Follow safety rules/ norms pertaining to all electrical installation.
2. Follow IE rules and regulations pertaining to all electrical installation.
3. Follow standard format while preparing tender.
4. Carry out market survey on the requirement of equipements mention in the tender while preparing quotation.

Procedure

1. Prepare tender document/ BID notice as suggested/ provided by staff member in standard format.
2. Specify all the terms and conditions in the tender notice as per the installation work.
3. Prepare quotation/BOQ for the prepared tender, mentioning technical specification with costing.

Resources Used

Sr. No.	Name of Resource	Suggested Plan	Quantity
1			
2			

III Actual Procedure Followed (use blank sheet if space is not sufficient)

pare tender document / BID notice as suggested/ ded by staff member on standard format
cify all the terms and conditions on the tender e as per installation cost
pare quotation / BOQ for the prepared tender, loning technical specification with costing.

IV Precautions Followed

ow safety rules / norms pertaining to all electrical llation. ② Follow safety rules & regulation pertaining electrical installation ③ Follow standard format preparing tender ④ Carry out market survey he requirement of equipments mention on the er while preparing quotation

XIII Assumption and Calculation (Preparation of tender and quotation as per IE standards and market rates).

(Use blank sheet if space is not sufficient)

- Properties of tender -
  1. Name of work
  2. Variety of tender
  3. Submission of tender
  4. Estimate money deposite
  5. Security deposite
  6. Excution of work
  7. Penalty of late exicution of work.
  8. Failure of exicution of work
  9. Submission of bills
  10. Loss of material.
  11. Compensation
  12. Damage of person.
  13. Idle layout hours
- Properties of quatation -
  1. Subject - Name of work
  2. Value of order
  3. Security deposite
  4. Delivery period
  5. Guarantee
  6. Payments
  7. Taxes
  8. Penalty for late delivery
  9. Specification
  10. Quality of supply:

XIV Results (Factors considers while preparing tender notice and BOQ)

From the practical we know prepare tender document quantities and

MAHAVITARAN
Maharashtra State Electricity Distribution Co. Ltd

e-Tender Notice

The Superintending Engineer, Latur Circle on behalf of MSEDCL (the Employer) invites tender (Tender Nos. SE/LTR/TS/SHH/T-20/2019-20) from eligible & reputed Agencies, for the Work for Supply, Erection, Testing & Commissioning of 33/11 KV S/stn for providing HT supply to Super Specialty Hospital, Gandhi Chowk, Latur.

Tenders will be processed only in electronic tendering mode and open for all bidders registered on e-tendering system for work contract for MSEDCL. The Bid Document will be available on website from 23/01/2020 to 12/02/2020, the last date for submission is 12/02/2020 up to 15.00. Tender will be opened on 12/02/2020 at 16.00 Hrs if possible.

For details visit our website on https://etender.mahadiscom.in/eatApp/

The undersigned reserves all the right to accept or reject any or all Tenders without assigning any reason there off.

PRO No. LZ/245/2019-20

Superintending Engineer
MSEDCL Circle Latur

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. Difference between BID and Quotation.
2. State significance of BOQ (Bills of Quantities) in tendering.
3. Difference between BOQ and Quotation.
4. List and explain the different types of tender and quotation.

Results (Factors considers while preparing tender notice and BOQ)

From the practical we know prepare tender document quotations and bill for specified work based on locality or installation

Interpretation and Assumption (Made while preparation of tender, notice & quotation).

From this practical we know the knowledge of various electrical product of different manufactures 9n relevence of technical, economical and service aspects.

Conclusions (The extent of practical outcome achieved in preparation of tender and quotation)

From this practical we conclude that the purpose of symbols 9n 9nstallation system also application & need of electrical accessories and protective devices based on type of 9nstallation.

VII Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design more such questions so as to ensure the achievement of identified CO.

1. Difference between BID and Quotation.
2. State significance of BOQ (Bills of Quantities) in tendering.
3. Difference between BOQ and Quotation.
4. List and explain the different types of tender and quotation.

Practical ... premises using Auto ...

I **Practical Significance**

Every diploma electrical engineer must have the knowledge about the significance of public lighting scheme. The knowledge of Auto-cad for making drawing of given public lighting installations by using standard symbol to represent equipment, distribution board etc. and their position / location as per IE rules.

Relevant Program Outcomes (POs)

- **Discipline knowledge:** Apply Electrical Engineering knowledge to solve broad based Electrical Engineering related problems.
- **Environment and sustainability:** Apply Electrical engineering solutions for sustainable development practices in societal and environmental contexts.
- **Engineering tools:** Apply relevant Electrical technologies and tools with an understanding of the limitations.
- **The engineer and society:** Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in the field of Electrical engineering.
- **Ethics:** Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice in the field of electrical engineering.
- **Communication:** Communicate effectively in oral and written form.

II **Competency and Skills**

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Plan electrical installations with their cost estimates.**

III ***Relevant Course Outcome(s)***

- *Interpret various electrical diagrams.*
- *Prepare estimate of public lighting installations.*

IV ***Practical Outcome***

- *Draw plan showing location of street light stays and route of the cable.*
- *Draw actual wiring diagram of above street light installation.*

V **Minimum Theoretical Background**

- Meaning and purpose of symbols used to represent electrical equipment in given electrical installation system.