UTILIZATION OF ELECTRICAL ENERGY LAB

Paper Code: ETEE-354
Paper: Utilization of Electrical Energy Lab

List of Experiments:

1. Verification of illumination laws. CO3
2. To plot polar curves for various lamps. CO3
3. Performance comparison of MV lamps, SV lamps, filament lamps, CFL & LED lights. CO3
4. Design of lighting schemes for house / commercial complex / industry / street light / flood light. CO3
5. Study of charging methods of batteries and calculation of their life cycle.. CO2
6. Charging and discharging of super capacitors. CO2
7. Characteristics of welding transformer. CO4
8. Demonstration of resistance / inductance / dielectric heating's. CO4
9. Speed control and Braking schemes for traction motors. CO1

ADVANCED EXPERIMENT:-

10. To study the terminology and use of LADSIM software and develop basic circuits on software using inputs and outputs and develop AND, OR, NOT circuits. CO2
11. To study the use of Latch, flag, timers, counters, BSR, BSL in LADSIM software and develop a circuit to control an automated inspection conveyor. CO1

NOTE: - At least 8 Experiments out of the list must be done in the semester.

Date 13.03.2023

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Expt. No. 1

Experiment-1

Aim :- To verify the Inverse square law

Apparatus required

Experimental Setup for measurements of light intensity of different lamps, optical Bench with uprights for folding of 10 X meter sensor.

Theory

- **Photometery**

This branch deals with measurement of intensity of illumination of a surface, illuminating power of a source light.

- **Luminous Flux**

It is defined as the ~~time~~ rate of flow of light energy from the source with the reference to visual sensation produced by it.

Its unit is lumens.

- **Inverse Square law**

Let O be point source of light & ds a small element of area at a distance r from it. If θ is angle that is normal to surface ds makes with direction of r,

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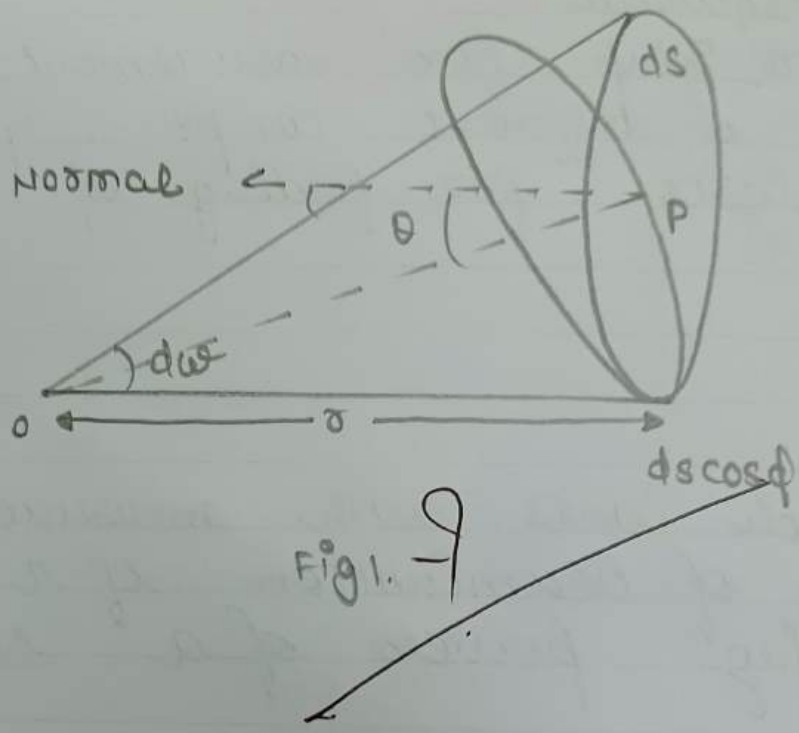

Fig 1. 9

ω is given by $d\omega = \frac{ds\cos\theta}{r^2}$

If L is the luminous intensity of source in direction of r, then

$$ds = L\,d\omega = L\frac{ds\cos\theta}{r^2}$$

According to notation, the intensity of illumination of a surface is

- $\propto ds$
- $\propto \frac{1}{r^2}$
- $\propto \cos\theta$. This is known as Lambert's cosine law.

Normal incidence, $\theta = 0$

$$I = \frac{L}{r^2}$$

This is inverse square law. It states that intensity of illumination is $\propto \frac{1}{r^2}$

- Luminous Intensity

The luminous intensity of a source of light is defined as the rate of flow of light energy through a unit solid angle.

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$$L = \frac{d\phi}{d\omega}$$

If ϕ is the total flux from point source of light then the total solid angle subtended.

$$L = \frac{\phi}{4\pi}$$

$$\phi = 4\pi L$$

The unit of luminous Intensity is Candela. One Candela is $\frac{1}{60^{th}}$ part of luminous Intensity of $1 cm^3$ surface of perfect black body.

Intensity of Illumination is defined as the luminous flux falling on a unit area of surface surrounding the given point.

SI unit is lux or meter candel

CGS unit is Phot

$1 lux = 10^{-4}$ phot

The candel power of source of light is diff in diff directions.

i) Mean Horizontal Candel Power
ii) Mean Spherical Candel Power
iii) Mean Hemi-Spherical Candel Power

$$= \frac{MSCP}{MHCP}$$

Observation Table

Distance cm	Light Intensity LUX		
	200W bulb	40W	15W
85	352	71	19
75	448	91	20
65	592	110	20
55	774	145	25
45	1086	200	30
35	1602	315	46
25	3150	540	84
15	6040	1578	220

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Reduction Power / Factor

$$RF = \frac{MSCP}{MHSCP}$$

Procedure

- Set the optical bench in horizontal position by adjusting levelling screws.
- Fix one lamp on holder.
- Fix sensor of flux meter on one of upright.
- Take readings
- Repeat step 3 & 4 for diff type of lamps.

Viva Questions

Q What is light?
The radiant energy from a hot body which produces visual sensation.

Q What is luminous flux?
The total quantity of light energy emitted per second from a luminous body is called luminous flux.

Q What do you mean by Illumination?
It is the luminous flux received by a surface per unit area.

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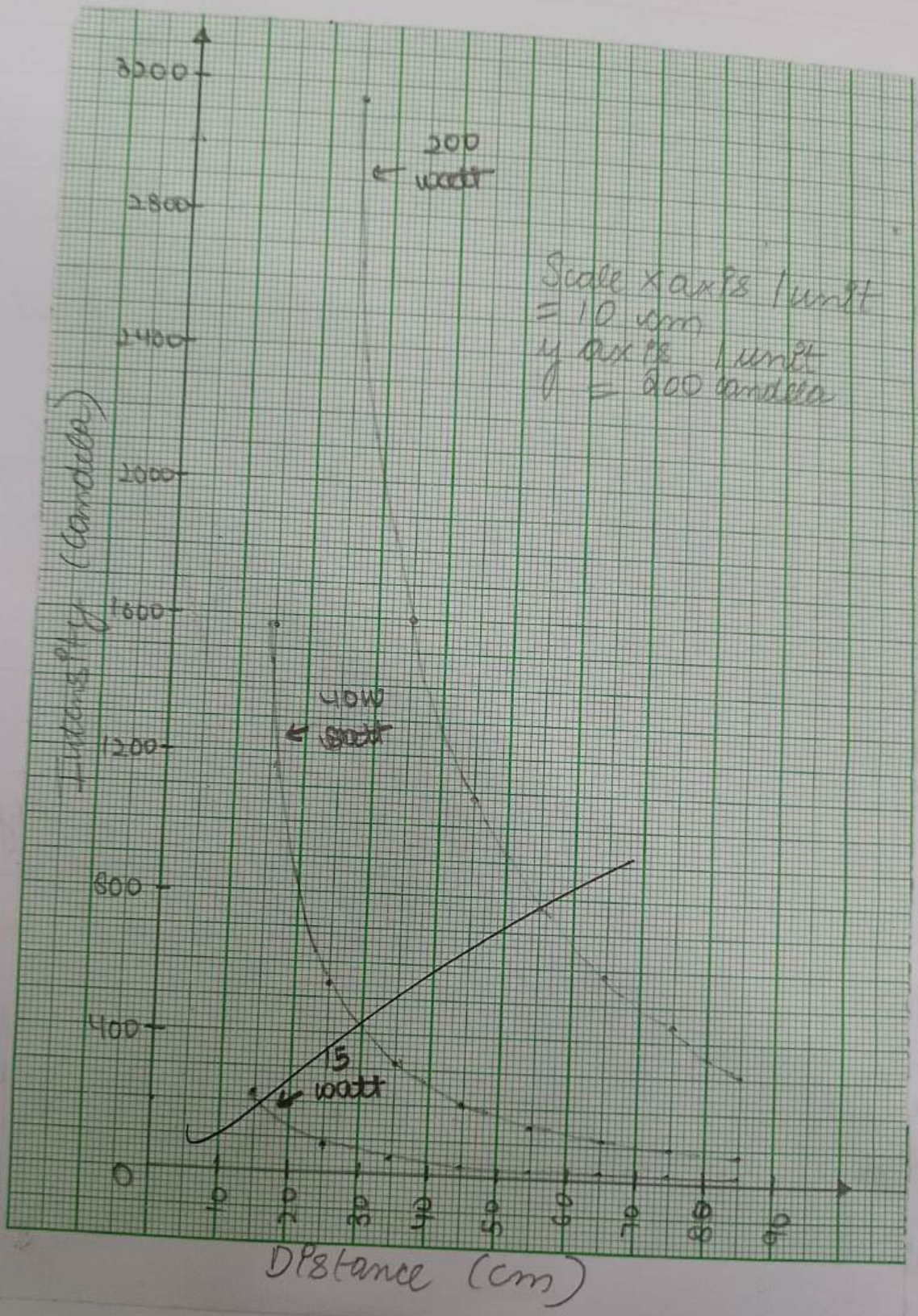
3200
2800
2400
2000
1600
1200
800
400
0
200 watt
40W
15 watt
Scale x axis 1 unit = 10 cm
y axis 1 unit = 200 candela
Intensity (candela)
Distance (cm)

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Q Define reduction factor
Reduction factor of a source of light is defined as the ratio of mean spherical candel power (MSCP) & MHSCP

Q Define depreciation factor & maintainence factor
Maintainence factor is ratio of illumination under normal working conditions to the the illumination when the light are perfectly clean.
Depreciation factor is the inverse of maintainence factor.

Q Define Absorption factor?
the ratio of total lumens available after absorption to total lumens emitted by the source of light is called absorption factor.

Q Describe inverse square law.
It states that Intensity of illumination is $\frac{1}{d^2}$ (distance b/w light source & surf)

$$E = \frac{1}{d^2}$$

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Expt. No.

Q What is Lambert's cosine law?
Acc to this law, E is $\propto$ to cosine of angle made by the normal to the illumination surface with the direction of the incident flux.

Q Define lamp efficiency
It is defined as the rate of luminous flux to the power input.

Q What is flux meter?
Lux meter is also called light meter, it is a device which is used to measure the amount of light in a space.

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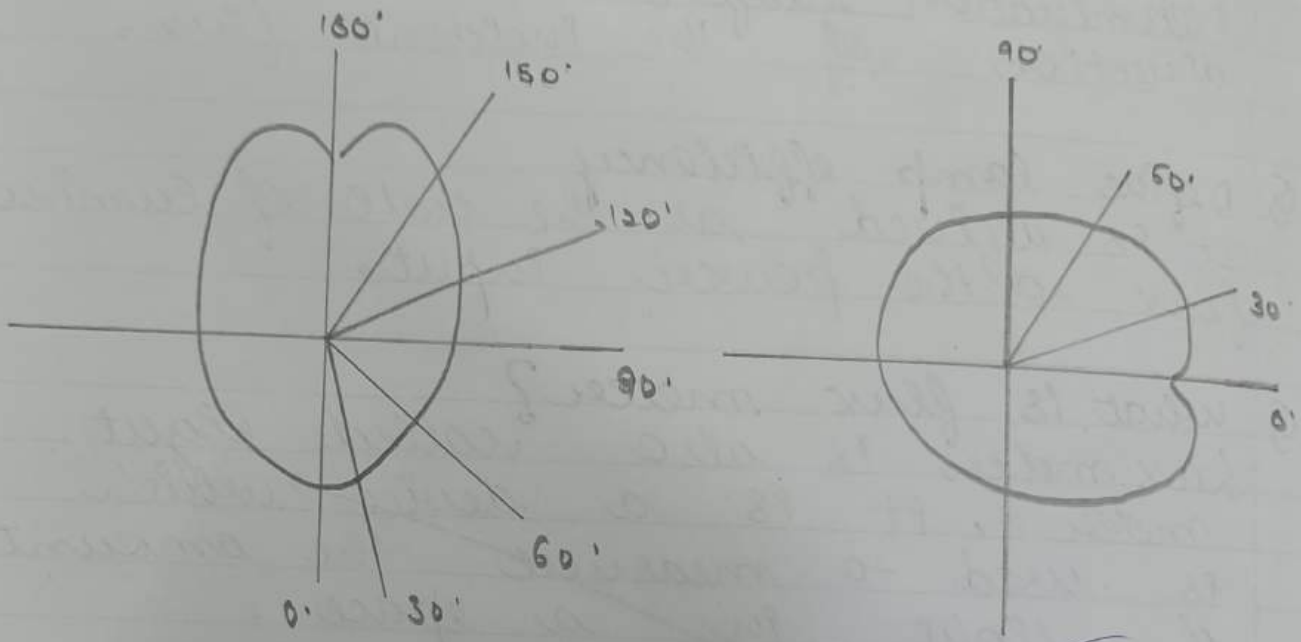

Fig. 1.

Date 20.03.2023

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Experiment 2

Aim:- To draw polar curves for different type of lamps

Apparatus required:- Arrangement of holding different type of lamps & to take readings of light intensity at different angles in horizontal as well as vertical planes, lux meter.

Polar curves

In most lamp or sources of light the luminous intensity is not the same in all directions. If the luminous intensity, i.e the candle power is measured in a horizontal plane about a vertical axis & a curve is plotted b/w candle power & the angular position, a horizontal polar curve or diagram is obtained.

If the candle power is measured at angular position in a vertical plane, a polar curve in the vertical plane is obtained.

The mean horizontal candle power of lamp can be found from the horizontal polar curve by determing the mean

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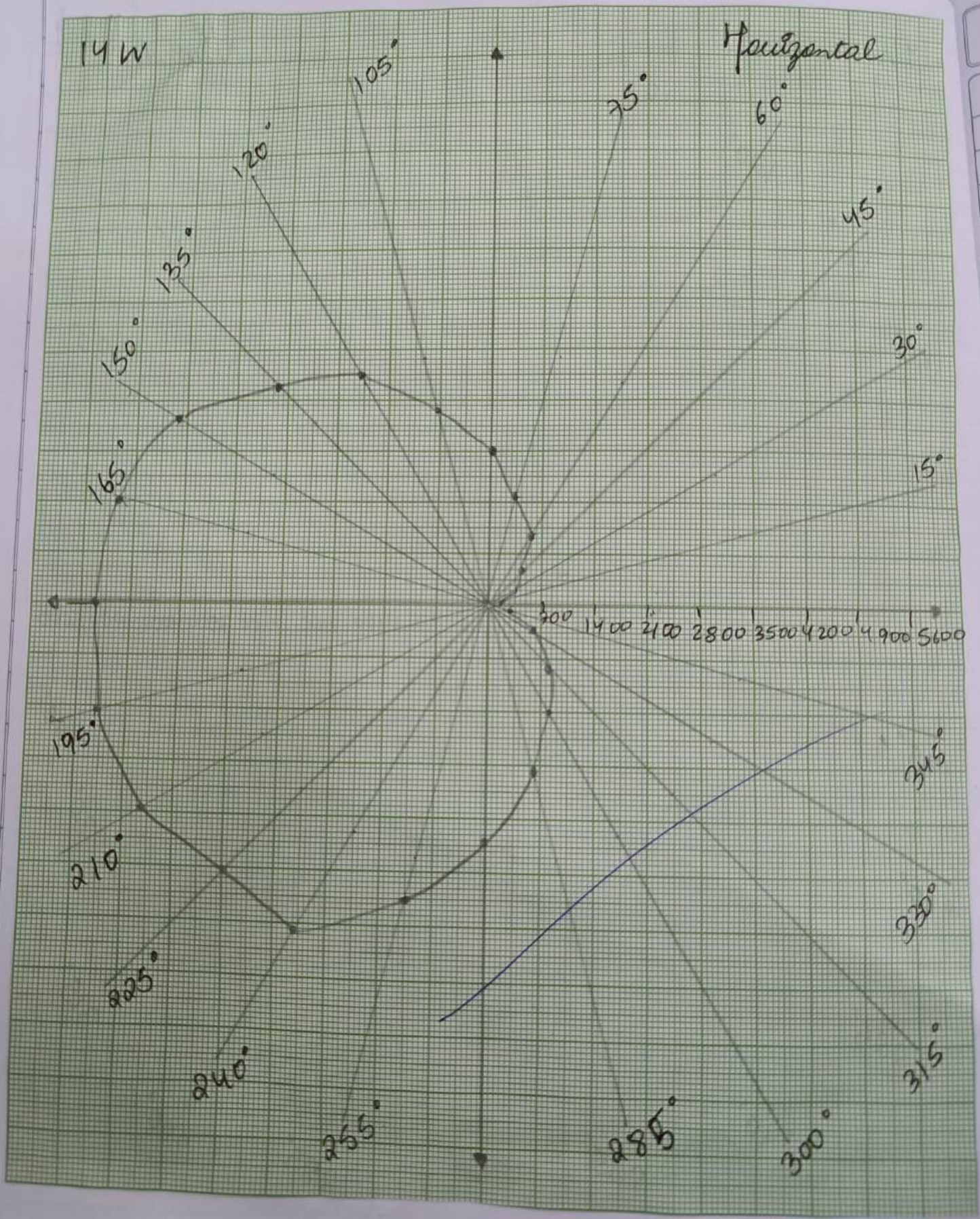
Degree	14W Bulb		40W Bulb	
	Horizontal	Vertical	Horizontal	Vertical
0°	0	0	0	0
15°	171	958	90	70
30°	399	552	1960	2290
45°	668	930	2030	2400
60°	1042	1585	2060	2450
75°	1480	2460	1970	2550
90°	2100	3460	1750	2500
105°	2750	4350	1810	2320
120°	3560	5100	1790	2180
135°	4200	5480	1680	2120
150°	4940	5610	1870	1920
165°	5200	5320	2030	2010
180°	5460	5180	2180	2100
195°	5550	4550	2140	2000
210°	5550	3950	2160	1800
225°	5400	3550	2100	1850
240°	4930	2630	2030	1800
255°	4000	2100	1960	1850
270°	3040	1720	1840	1900
285°	2220	1090	1920	1770
300	1472	750	1830	1890
315	950	500	1740	1940
330	550	360	1490	1580
345°	194	150	80	70
360°	0	0	0	0

value of the candle power in horizontal direction.

Procedure

1) Fix 1 particular bulb in polar curve apparatus
2) Take reading of lux meter by placing its sensor at different angles in the horizontal plane.
3) Take reading of lux meter by placing its sensor at different angles in vertical plane.
4) Draw horizontal & vertical polar curve.


14 W
Horizontal
105°
75°
60°
120°
45°
135°
150°
30°
165°
15°
700
1400
2100
2800
3500
4200
4900
5600
195°
345°
210°
330°
225°
315°
240°
300°
255°
285°

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Viva Questions

Q What is difference between Illumination & light?
Light is the cause & Illumination is the result of that light on surface on which it falls.

Q Define Candle Power
Candle power is light radiating capacity of a source in a given direction & is defined as no. of lumens given out by the source in unit solid angle in given direction.

Q Diff b/w Candela & Lux
Candela or lumens/steradian, is unit of luminous intensity while lux is unit of illumination.

Q what are laws of illumination?
- Law of Inverse Square
- Lambert's cosine law

Q what do you understand by polar curves?
It is the plot of luminous intensity (can be both horizontal & vertical position) against angular position.

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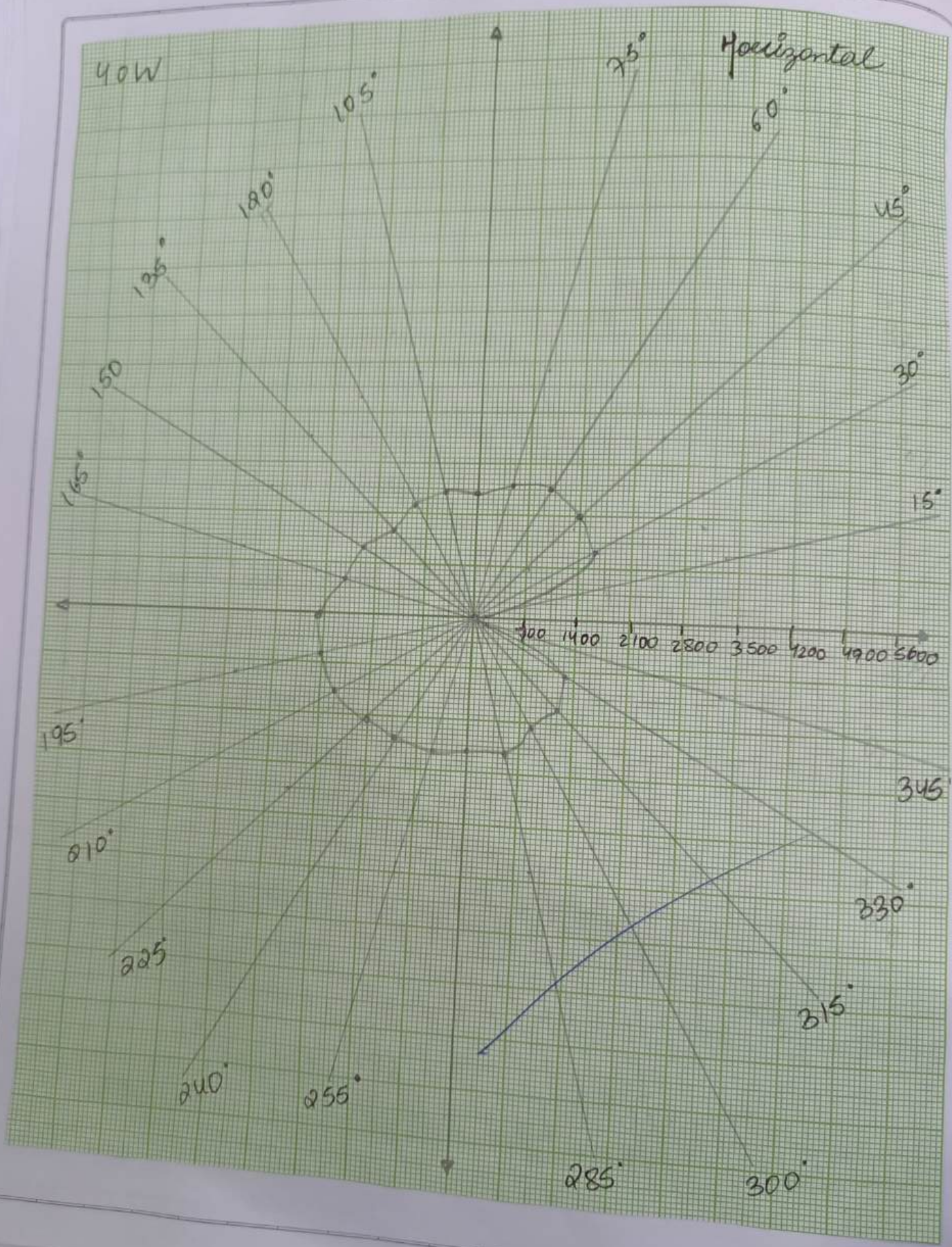
40W
Horizontal
75°
60°
45°
30°
15°
0°
105°
120°
135°
150°
165°
180°
195°
210°
225°
240°
255°
285°
300°
315°
330°
345°
700
1400
2100
2800
3500
4200
4900
5600

Q why is it called polar?
The unequal sharing of e⁻s b/w the stars & the unsymmetrical shape of molecules.

Q Can length of curve be zero?
If curve connected to diff points, no matter what is the curve is the length is non-zero.

Q Can the length of polar curve be -ve?
The length of curve is never negative.

Q What is formula of polar curve?
The arc length of a polar curve $r = F(\theta)$ between $\theta = a$ & $\theta = b$ is given by integral $L = \int_a^b \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}\, d\theta$.

Q What is range of polar curve?
r range from 0 to infinity & θ range from 0 to 2π.

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Date 27.03.2023

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Experiment 3

Aim:- To design lighting scheme of an area.

Theory

- Characteristics of a Good lighting scheme
- It should provide adequate Illumination.
- It should provide light distribution all over working place.
- It should avoid glare & hard shadows as far as possible.
- It should provide light of suitable colour.

Factors to be considered for designing the lighting scheme

- **Intensity of illumination:-** The intensity as illumination required for diff types of work differ
- **Selection of luminaries:-** luminaries is the apparatus which distributes filter or transforms the given by a lamp.
- The choice of lamp for diff types of occupancies differs.
- Tubular fluorescent lamps can be used

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when lighting is to be done in small premises.

- In case of large premises, the lighting can be carried out by using high intensity sources.
- Size of room :- The lumen o/p of source is not fully utilized at workplace & is taken into account by factor known as 'coefficient of utilization.'
- lumen o/p of fitting
- Size & shape of room
- Height of ceilings
- Mounting height & spacing of fitting : It is apparent at the fitting for general lighting should be such place the illumination received for each fitting overlaps & build up that as it neighbours.
- Conditions of use :- It varies with diff types of installation. The following formula can be used to calculate the illumination.

$$N = \frac{E * A}{O * UF * MF}$$

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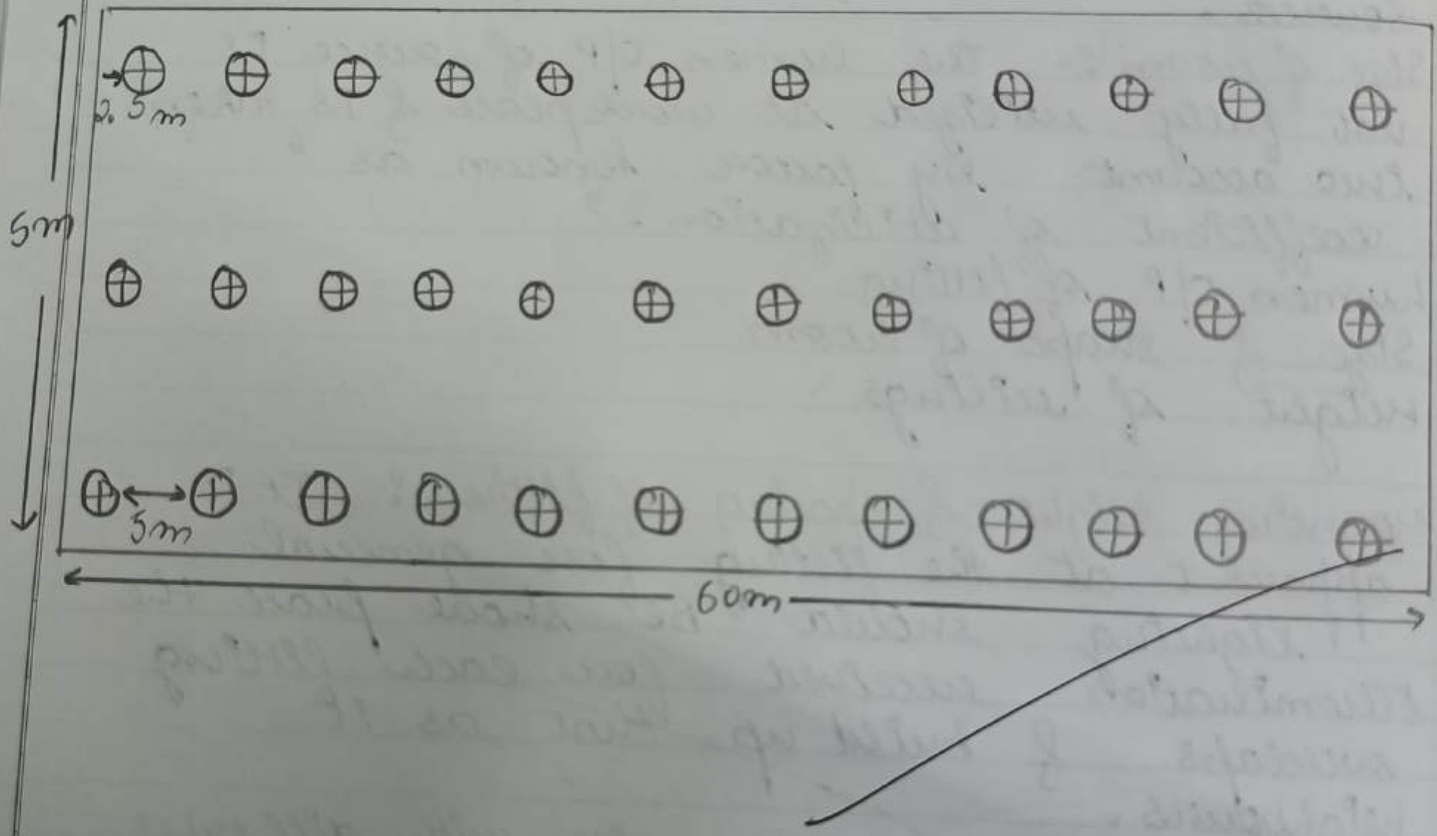
5m
3m
3m
60m

1) Calculate the no. of wattage of lamps which would be required to illuminate a workshop space 60 x 15 m by means of lamps mounted 5 m above the working plane. The average illumination required is 100 lux.

$$\text{Flux} \Rightarrow \phi = \frac{E \times A}{UF \times MF} = \frac{100 \times 60 \times 15}{0.42 \times 0.8}$$

$$= 267857.1 \text{ lumen}$$

Total wattage ratio = 1, h = 5 m

Along breadth, lamps are = 15/5 = 3

Along length, lamps are = 60/5 = 12

Total no.s of lamps are = 12 * 3 = 36

$$\text{Wattage of each lamp} = \frac{\text{Total wattage}}{\text{Total lamps}}$$

$$= \frac{16741}{36} = 465 \text{ W}$$

2) The following data relate to lighting scheme of an engineering clg: dimensions of wall 30 x 20 x 8 m, mounting height = 5 m, req level of illumination 144 lumens/m^2 UF = 0.6, MF = 0.75, SH ratio = 1, lumens per watt for 300 watt lamp = 13 lumen/watt, lumen for 500 watt lamp 16 lumen/watt using metal filament lamp, estimate the size & no. of single lamp luminous

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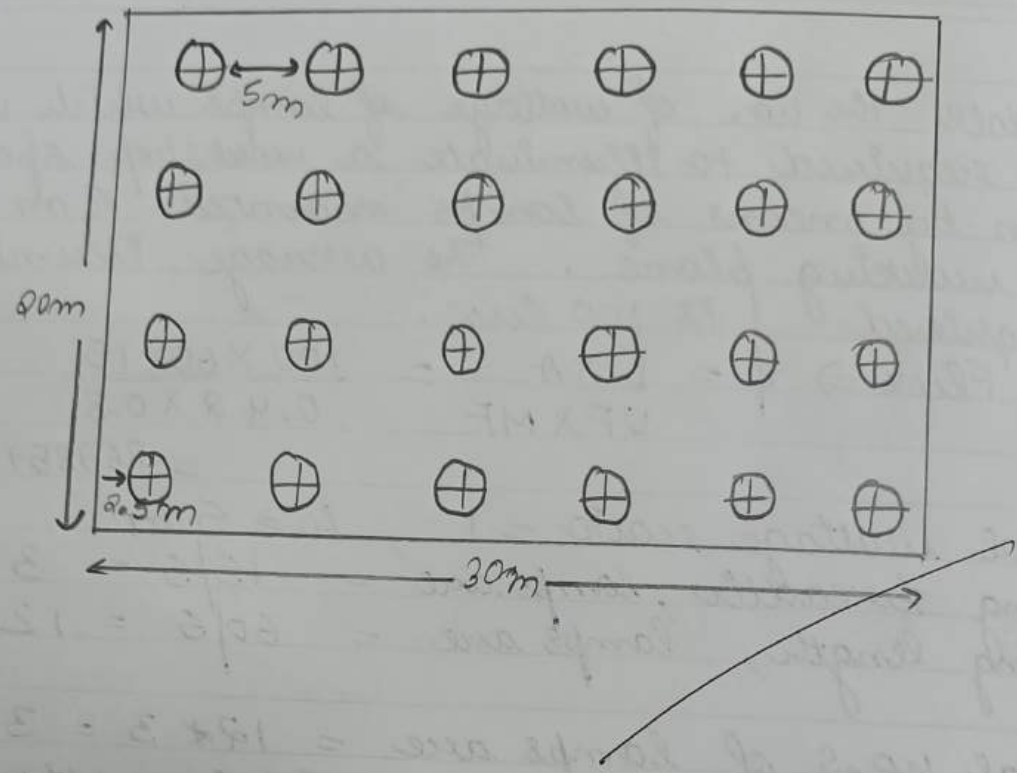
5m
20m
2.5m
30m

Area = $30 \times 20 = 600\ m^2$

Flux = $\frac{E \times A}{VF \times MF} = \frac{144 \times 600}{0.6 \times 0.75} = 192000$ lumens

Output for 500 watt lamp = $16 \times 500 = 8000$ lumen

Output " 300 " " = $13 \times 300 = 3900$ lumen

No. of 500 W lamp required = $\frac{\text{Flux}}{\text{output}} = \frac{192000}{8000}$

= 24 lamps

No. of 300 W lamp = $\frac{192000}{3900}$ = 42 lamps.

3) A drawing hall 40x25x6 m is to be illuminated with metal gas filled lamps to an average illumination 90 lux/m^2 on working plane 1m above. Estimate suitable no. size & mounting height of lamps.

VF = 0.5, DF = 1.2 & SH ratio = 1.2

Size of lamps	200W	300 W	500 W
luminous efficiency	16	18	20

$A = 40 \times 25 = 1000\ m^2$

DF = 1.2 MF = $1/DF = 1/1.2 = 0.83$

Flux = $\frac{E \times A}{VF \times MF} = \frac{90 \times 1000}{0.5 \times 0.83} = 216867.4$ lumen

lumen output for 200W = $200 \times 16 = 3200$ lumens

" " " 300 W = $300 \times 18 = 5400$ lumens

" " " 500 W = $500 \times 20 = 10000$ lumens

No. of 200 W lamp req = $\frac{216867}{3200} = 68$

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No. of 300W lamp req = $\frac{216867}{5400}$ = 40

No. of 500W lamp req = $\frac{216867}{10000}$ ≈ 22

4) A hall 30m long & 12m wide is to be illuminated & illumination req is 50m candles. 5 type of lamps having lumen o/p as given are available

Watt	100	200	300	500	1000
lumens	1615	6350	4700	9950	21500

DF = 1.3 & UF = 0.5 cal no., wattage of each unit

A = 30×12 = 360 m², MF = 1/DF = 1/1.3

$$\text{Flux} = \frac{E * A}{UF * MF} = \frac{50 \times 360}{0.5 \times 0.76} = 47368$$

No. of 100W lamps req = $\frac{47368}{1615}$ = 29

No. of 200W lamps req = $\frac{47368}{6350}$ = 13

No. of 300W lamps req = $\frac{47368}{4700}$ = 10

No. of 500W lamps req = $\frac{47368}{9950}$ = 5

No. of 1000W lamps req = $\frac{47368}{21500}$ = 2

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Viva Questions

Q what are the objectives of lighting scheme?
The purpose of lighting is to enable visual tasks to be performed efficiently & accurately. The purpose is to satisfy people's expectation for how lighting may influence the appearance of surroundings.

Q what are the types of lighting scheme?
a) Direct lighting b) Semi - direct lighting
c) Semi - Indirect d) Indirect lighting.

Q what are factors to be considered for designing the lighting scheme?
a) Intensity of illumination b) Selection of luminaires c) Size of room d) Mounting height & spacing of fitting.

Q what are benefits of good lighting design?
A good lighting design can make or break a building. Lighting can help create ambience, lead patterns through a space, add height or depth to a structure & improve functionality.

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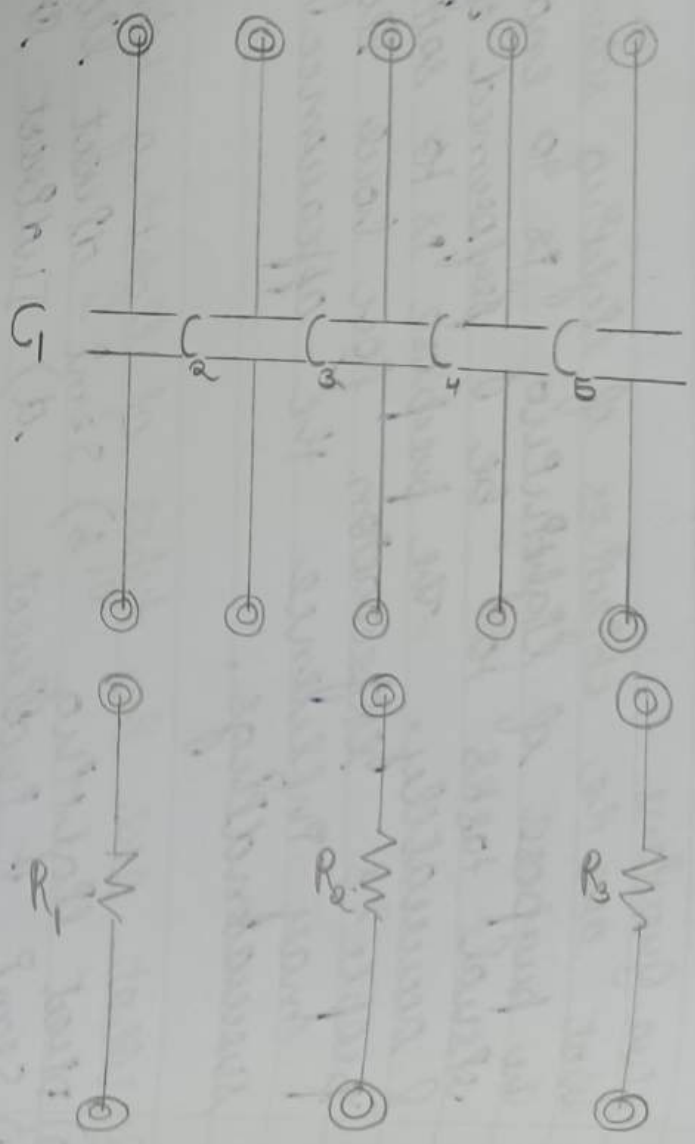
STUDY OF CHARACTERISTICS OF CHARGING &

DISCHARGING OF SUPER CAPACITOR



Date 03.03.2023

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Experiment 4

Aim :- To study charging & discharging of super conductor.

Instruments Required

1) DC voltage Source
2) DC Current Source
3) Resistances (5Ω, 10Ω, 100Ω)
4) Super Conductor (1F & 5.5V)
5) Digital Multimeter

Theory

Simple models for super capacitors are developed to describe the charge & discharge behaviours in presence of both current & voltage source. Super capacitors are considered important energy efficiency devices for rapid energy.

In order to ↑es energy density, acc to energy density eqⁿ $E = \frac{1}{2} CV^2$

where E is energy density, C is specific capacitance & V is cell voltage.

In general for charging & discharging a super capacitor there are 2 major options. One is charging & discharging at a constant cell

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Observation Table

For charging

Time (s)	Voltage (V)	Time (s)	Voltage (V)
0	0.64	560	5.45
5	2.99	590	5.49
10	3.25		
15	3.41		
20	3.59		
25	3.70		
30	3.80		
35	3.92		
40	3.99		
45	4.04		
55	4.12		
65	4.21		
90	4.35		
110	4.42		
130	4.54		
150	4.71		
170	4.83		
190	4.94		
210	5.03		
250	5.16		
270	5.3		
320	5.32		
340	5.34		
360	5.35		
380	5.38		
440	5.40		
470	5.41		
500	5.42		
530	5.44		

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voltage to record the cell current change with time & other is charging & discharging at a constant current to record the cell voltage with change with time.

Procedure

By using Current Source

1) Connect the current or voltage source across the capacitor & connect the CRO or Multimeter across the super capacitor & plot graph b/w charging voltage & time.
2) Repeat steps 1 to 6 with different voltage.
3) In this step, now disconnect power supply & connect to super capacitor with resistors & plot graph b/w voltage across the super capacitor & time.
4) Repeat steps 1 to 6 with different combinations of load resistances.

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For discharging

Time(s)	Voltage(V)	Time(s)	Voltage (V)
0	5.09	620	3.15
5	5.04	680	3.09
10	4.93	740	2.97
15	4.90	800	2.85
20	4.87	860	2.73
25	4.81	920	2.62
30	4.78	980	2.54
35	4.74	1040	2.39
40	4.72	1100	2.19
45	4.68	1160	2.01
55	4.63	1220	1.89
65	4.59	1280	1.61
90	4.56	1340	1.44
110	4.52	1400	1.23
130	4.44	1460	1.01
150	4.38		
160	4.33		
180	4.28		
200	4.21		
260	4.15		
220	4.09		
280	3.94		
320	3.89		
380	3.78		
410	3.69		
440	3.58		
470	3.51		
500	3.44		
560	3.36		
590	3.26		

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Viva Questions

Q What are supercapacitors?
They are electrochemical energy storage devices that store & release energy by reversible adsorption & desorption of ions at the interface b/w electrode materials & electrolytes.

Q What is use of supercapacitor?
It is used for energy storage undergoing frequent charge & discharge cycles at high current & short duration.

Q How supercapacitor operates?
It operates storing electrical energy b/w 2 electrostatic double layers created by formation of thin charge layers on the electrolyte - electrode interface.

Q What is basic principle of supercapacitors?
It is principle is to store electrical energy through the electric double-layer capacitance formed by charge separation on interface b/w the electrolyte & bath solution.

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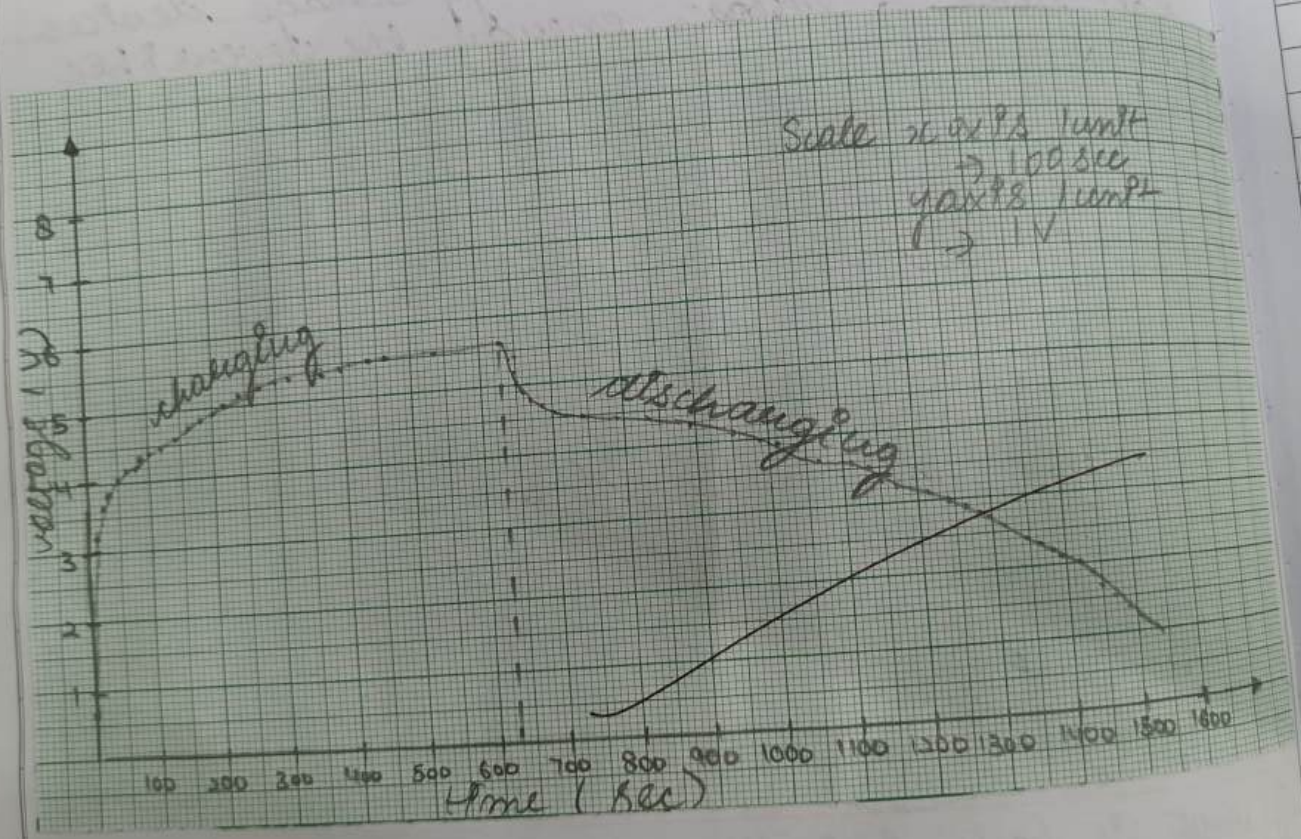
Scale x axis 1 unit → 100 sec
y axis 1 unit → 1V
Voltage (V)
charging
discharging
Time (Sec)
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600
1 2 3 4 5 6 7 8

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Q Are supercapacitors AC or DC?
They work on DC supply, as they depend on DC power.

Q What is the maximum voltage of a super capacitor?
The maximum voltage of a super capacitor is 2.7 V.

Q What is lifespan of supercapacitor?
They have a lifespan ranging from 100,000 to a million cycles.

Q What are disadvantages of supercapacitor?
- Have voltages exist within individual cells.
- They discharge themselves more frequently.

Q Differentiate b/w Supercapacitor & Ultracapacitor.
The supercapacitor also known as ultra capacitor or double layer capacitor, differs from it in that it has very high capacitance.

Q What is charging time of supercapacitor?
The charge time of a supercapacitor is 1-10 seconds.

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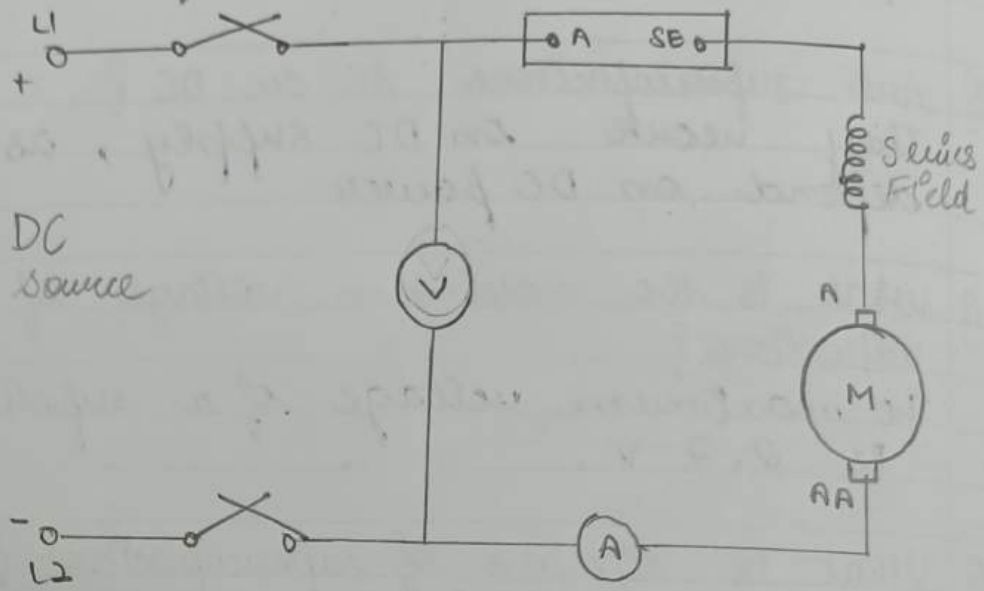
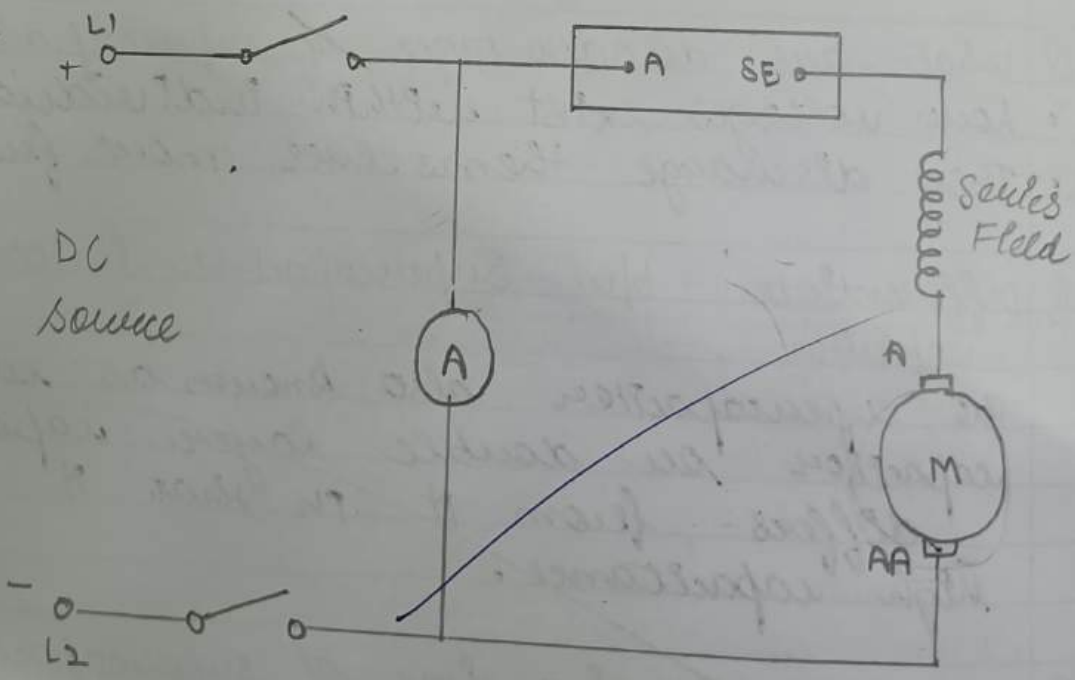
By Dyamic Breaking



After Dyamic Breaking



Date 17.04.2023

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Experiment 5

Aim :- To study braking scheme of traction (dc series) motor.

Instruments Required

1) MC Voltmeter 0-300V (1)
2) MC Ammeter 0-20A (1)
3) DC Series Motor with dynamic braking agreement (1)

Theory

Electric Braking of DC motor can be done by :- Dynamic braking or rheostatic braking by including an external resistance across the armature or directly short to the armature terminal of DC motor in place of DC supply.

This method, makes the DC motor work as a generator but it dissipates the power in armature winding or external resistance connected.

Procedure :

Result :

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Observation Table

RPM	Voltage (V)	Current (A)
1900	120	1
3000	220	1.5
2750	200	1.2
2470	170	1.1
2230	150	1.1
2050	135	1.1
1910	130	1

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Viva Questions

Q what is dynamic breaking
It is the use of an electric traction motor as a generator when slowing a vehicle such as electric or diesel electric locomotive.

Q what is dynamic breaking used for?
It is used to dissipate excess energy generated when the load controlled by an adjustable freq drive is quickly stopped.

Q what are examples of dynamic breaking?
Centrifuges, pumps, fans, conveyor belts are some applications of dynamic breaking.

Q what is disadvantage of dynamic breaking?
You can't reduce the motor speed to a large extent than synchronous speed.

Q what is duty cycle of dynamic breaking?
The duty cycle is 20% - 10 seconds on 40 seconds off - with a cycle time of 50 seconds.

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Date 29.05.2023

Expt. No. 6 Page No.

Experiment - 6

Aim :- Demonstration of resistance heating

Apparatus Required :- Resistance heating for demonstrating resistance heating, the setup will be consisting of drum container provided with system of lifting arrangement to raise or lower the melting surface.

Theory

- **Water Rheostat**

A liquid rheostat or salt water rheostat is a type of variable resistor. In simplest form it consist of a tank consisting electrolyte solution in which electrodes are submerged to create an electrical load. To stabilize the load, mixture must not be allowed to boil.

Description

- **Water Rheostat**

It is useful for loading purpose in the laboratory for single / three phase AC supply.

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Observation Table

Voltage fixed (400V)

Current (A)	Temperature (°C)
26	33
28	34
30	35
32	36.1
38	38

- Water container
Drum height about 2 Ft, capacity about 50 l with fitting for drawing filling of container through locks.

- Electrodes
3 Cu electrodes Cadium finished sleeve as anodes. The electrodes are insulated from each other to make it work.

- Mechanism
Provided with system of lifting arrangement to ↑es or ↓es the wetting surface of electrode plates by means of worm & gear mechanical through a hand operated wheel.

Current Use
At constant voltage when current goes in water then temp of water is ↑es & when temp of water ↑es then again load current ↑es at same voltage. So we will take the reading of terminal voltage load current & temp.

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Viva Questions

Q What is resistance heating also known as?
Joule heating

Q What is the use of heating resistance?
It is used for joining small components.

Q What are advantages of resistance heating?
- Silent operation
- High degree of efficiency
- Low maintenance
- Very short time period for heating

Q What are the disadvantages of resistance heating?
- Current can't be varied
- Applicable only on electrical conducting material.
- Corrosion to Cu connection cables.

Q What are modes of heat transfer?
- Conduction
- Convection
- Radiation

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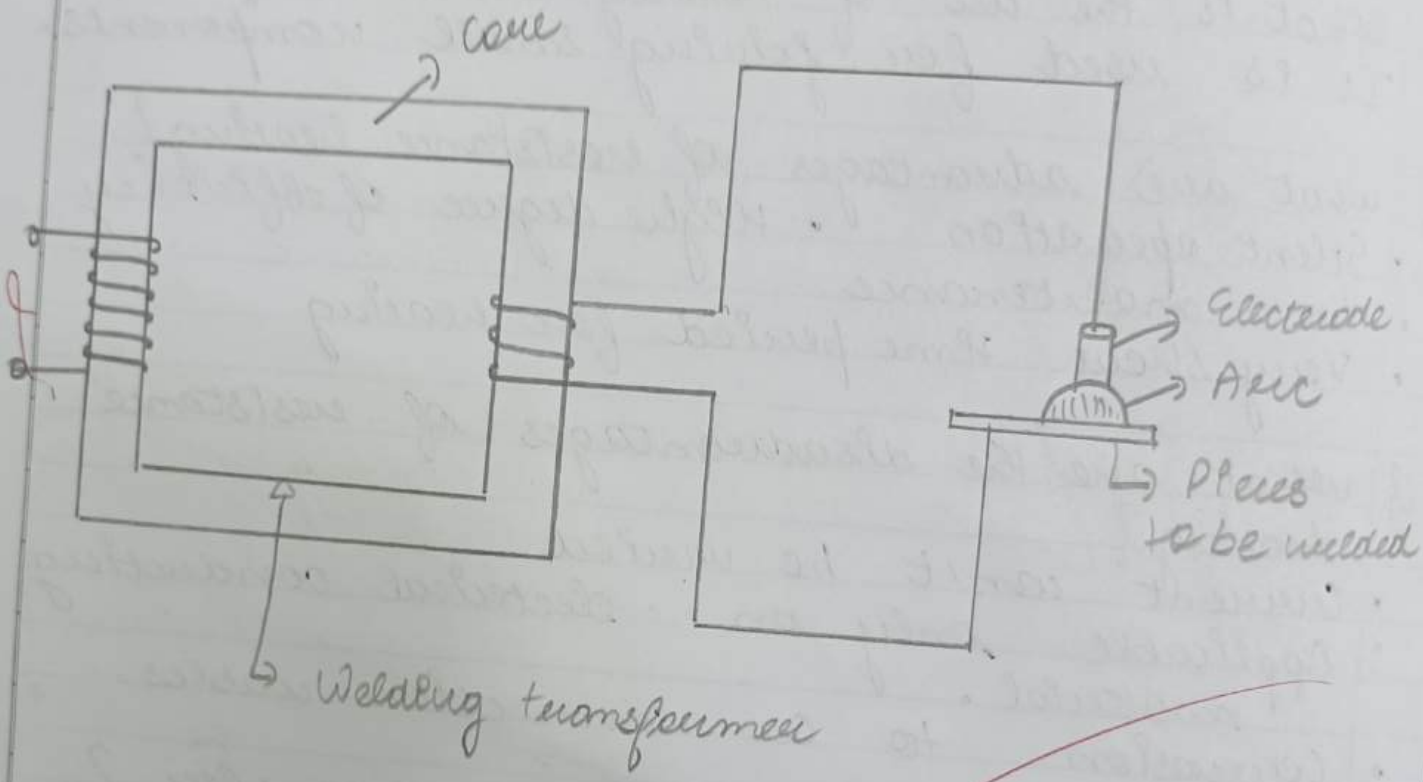
Core
Electrode
Arc
Pieces to be welded
Welding transformer

Date 29.05.2023

Expt. No. 7 Page No.

Experiment 7

Aim :- To study Characteristics of welding transformer.

Instruments Required

- AC Voltmeter 500V
- AC Ammeter
- Welding transformer
- Welding electrode
- Holder
- Goggles.

Theory

Welding transformer are used in AC machines to change alternating current from power line into a low voltage high amperage current in the secondary winding. Transformer ratings for AC machines are expressed in KVA.

Welding transformer is a transformer having their primary winding with larger no. of turns. This ensures very high current & less voltage in the secondary.

One end of secondary is connected to welding electrode & another end is connected to the pieces to be welded. This is very large heat.

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Observations

Primary side voltage = 250V

" " current = 17A

Secondary side voltage = 42V

$V_1 I_1 = V_2 I_2$

" " current = $\frac{V_1 I_1}{V_2}$

$= \frac{250 \times 17}{42}$

$= 102A$

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Procedure

- Connect the primary winding to 230 V/415 V AC supply acc to connection diagram.
- Secondary I winding is connected to welding electrode & another end is connected to pieces to be welded.
- Take the reading V_o, V_w, I_w & I_s & make the table

Viva Questions

Q Which transformer is used in welding?

- Step down transformer

Q Why step down transformer is used in welding

- A welding transformer is required which converts the high voltage & low current into low voltage & high current.

Q What is the principle of welding transformer

The wires are wrapped around an iron core which creates a magnetic flux from the movement

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of electric energy through the transformer.

Q What are parts of welding transformer
- Normal reactance
- Single phase
- Step Down transformer
- Separate reactor
- choke.

Q what is the application of welding transformer.
They are used in AC machines, high amperage current in the secondary winding.

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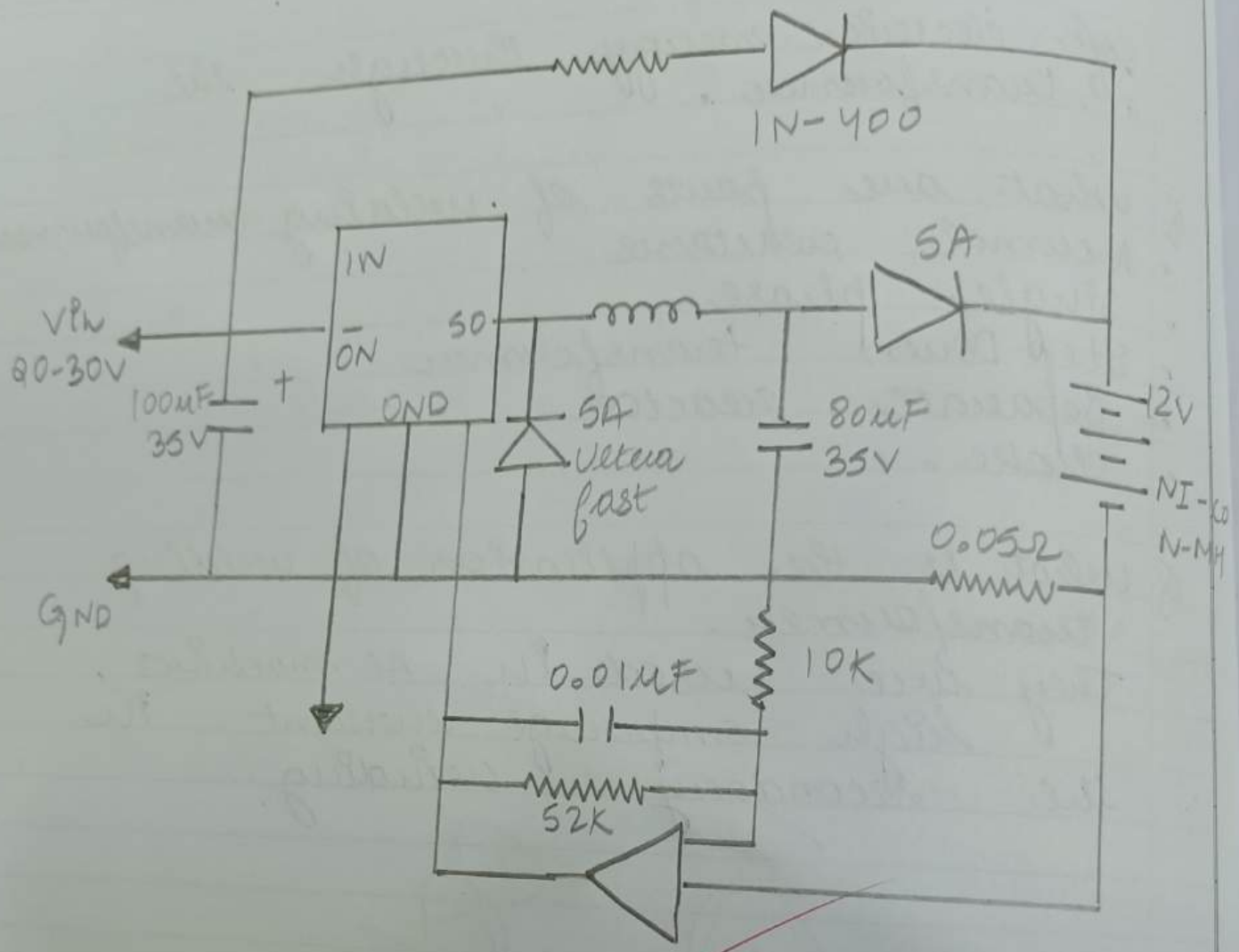

NI-CD, NI-MH CHARGER

Expt. No. 8 Date

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Experiment 8

Aim :- Study of charging method of batteries & calculation of their life cycle.

Theory

Basic Charging Methods

→ Constant voltage :- It is basically a DC power supply which in its simplest form may consist of step down transformer from the mains with a rectifier to provide DC voltage.

→ Constant Current :- Const current chargers vary the voltage they apply to the battery to maintain a const current flow, switching off when voltage reaches the level of full charge.

→ Taper current :- This is charging from crude unregulate constant voltage source. It is not a controlled charge as in V Taper above.

→ Pulsed charge :- They feed the charge current

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to battery in pulses. The charging rate can be precisely controlled by varying the width of the pulses, typically about one second.

- Calendar Life & Life cycle
Battery performance deteriorates over time whether the battery is used or not. This is known as "Calendar Fade".

- Battery Calendar Life
It is the elaped time before a battery become unusable, whether it is in active use or inactive.

- Burp charging
Also called reflex or negative pulse charging, used in conjunction with pulse charging.

- 101 charging
This is recently developed charging profile used for fast charging standard flooded lead acid batteries from particular manufacturers.

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- Trickle charging
It is designed to compensate for the self discharge of the battery, continuous charge, long term constant current charging for standby use.

- Float charge
The battery & load are permanently connected in ∥ across the DC charging source.

- Specific Charging Methods

Nickel - Cadmium (Ni - Cd)
Nickel Metal - Hydride (Ni - MH)
Lithium - Ion (Li - Ion)

Slow charge
Slow charge is usually defined as a charging current that can be applied to the battery indefinitely without damaging the cell.

→ Advantage
This means the charger is simple.

→ Disadvantage
long time to recharge the battery.

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Viva Question

Q What are charging methods?
There are 3 ways to do it :- Friction, conduction & induction.

Q What is Calendar life of a battery?
It is time for which a battery can be stored as inactive such that its capacity remains above 80%.

Q What is Life cycle of a battery?
The no. of charge & discharge cycles that a battery can complete before losing performance!

Q What is a Li - Ion battery?
It is the most popular rechargeable battery chemistry used today.

Q What is Ni - Cd battery?
It is a type of rechargeable battery using Nickel oxide hydroxide & metallic cadmium as electrodes.

Q What is Slow Charge?
It is usually defined as a charging current that can be applied to the battery indefinitely without damaging the cell.

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Expt. No.

LADSIM Demonstration Version

File Edit Simulations Setup Control Help

Rung 0

Rung 1

Rung 2

Rung 3

Expt. No. 9 Date 05.06.2023

Page No.

Experiment 9

Aim:- To study the terminologies & use of LADSIM software & develop simple basic circuit on software using inputs & outputs & develop AND, OR & NOT circuits.

Software Required:- LADSIM

Theory

- **Rung** - It refers to horizontal line within ladder diagram, representing a logical expression or condition in a ladder program. It consists of 1 or more ladder logic elements such as contacts, coils & other elements.
- ⊣⊢ - Represents a normally open contact.
- ⊣/⊢ - Represents normally closed contact.
- ⊣( )⊢ - Represents output.

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There are more important tools that help in building addition of many, a branch, counters & timers for generating supporting circuits.

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Viva Questions

Q What is full form of LADSIM
Ladder Logic - Simulation software

Q How do you make a branch?
Input Scan
Program Scan
Output Scan
Housekeeping

Q Give the examples where & how can AND and OR ckt be used
AND gate is used in a gumball machine, in order to dispense a gumball, you have to insert a coin & use AND gate & press the button, OR gate is used in CMOS.

Q What is the use of LADSIM?
It includes a visual editing environment for graphical programming
Its functions include inputs, output, timers, counters, flags & shift registers.

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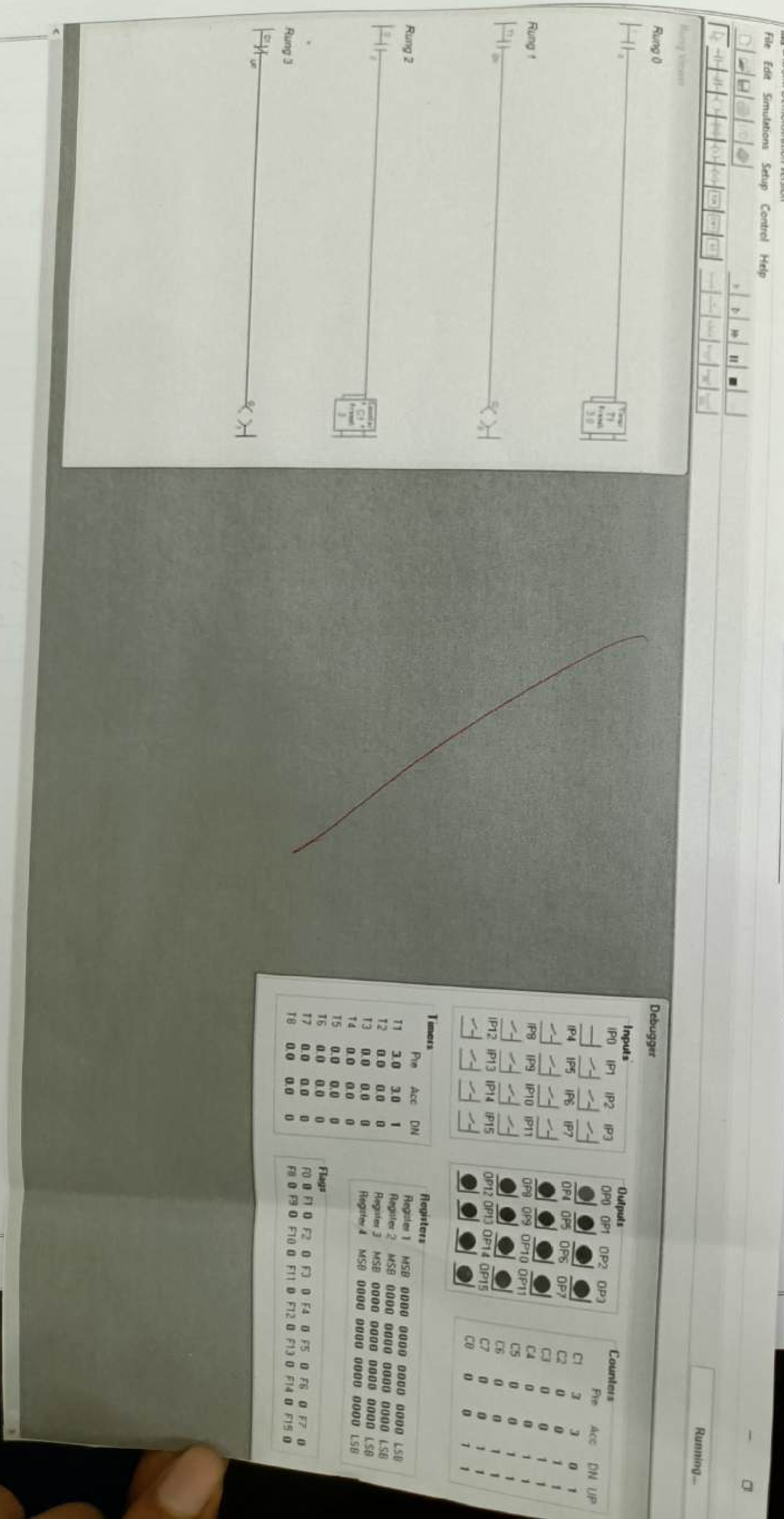

Expt. No. 10

Aim :- T
counters
develop
control
convey

Software

Theory

- Latch :-

- Timer :

- Counter

Expt. No. 10 Date 12.06.2023

Page No.

Experiment - 10

Aim :- To study latch flag, timers, counters in LADSIM software & develop simple basic circuits to control an automated inspection conveyor.

Software required :- LADSIM

Theory

- Latch :- It is a very useful facility, only requires input to be energised momentarily for the output to be switched 'ON'.

- Timer :- It allows precise control over events that have been programmed. By using this we can dictate till what time the conveyor will run or stop.

- Counter :- They are usually used to count the no. of

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events that have occured, for example counting how many components have passed a certain pt on a component conveyor, or after how many components passing through the conveyor should stop.

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Viva Questions

Q What does resetting of timer means in LADSIM?

When the selector switch is OFF & the timer reset button is pushed the timer accumulated value with reset to 0 & the timer done bit will turn off.

Q Can we reset counter in between?

Yes, when the second input of the counter instruction box (16 R) is the reset input, receiving virtual power from the contact IN switch reset whenever the reset pushbutton is pressed.

Q How do you reset a timer?

The count up & count down instructions are reset with either the reset instruction or by moving a 0 into the respective Accumulators.

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