III BSC

SIXTH SEMESTER PAPER-VIII

CE-1, CE-2,CE-3

PHYSICS PRACTICALS

LAB MANUAL

(OLD SYLLABUS)

Department of Physics

Sri Y.N.College (A)

Narsapur

Experiment No. : 1

Date : 2/11/22 Page No. : 1

Experiment Name : Solar Radiatio using pyrheliometer

Aim:

Todetermination of Solar constant by using Angstron's pyrheliometer.

Apparatus:

S_1 and S_2, double walled shield H, the backs of S_1 & S_2, golvanometer (G), Battery, voltmeter, plug key (K), residence, Ammeter.

Formula:

$$S = \frac{V \cdot I \times 60}{A \cdot a \cdot 4.2} \text{ cal/cm}^{-2}\text{m}^{-1}$$

Where, V = voltmeter

I = current

A = Area of the cross-section of the strip

a = It's absorption coefficient.

s = Solar constant.

$\log s = \log s_0 + \sec z \cdot \log \tau$

τ = transmission Coeffiecient

z = Zenit distance of the sun

construction:

It consists of two thin exactly similar blackened strips of the platinum (or) constatan S_1 and S_2 the two strips are arranged such that one is open to recieve radiation from sun normally which the other is protected by a double walled shield H. copper and Constantan wire through galvanometer G. The Strip S2 is heated electrically with the help of electric circute as shown in fig ①

Working :

when S1 and S2 are at the same temperatur then galvanometer G. shows no deflection. when S1 is exposed to radiation from the sun it's temperature raises and galvanometer shows deflection. Now current is passed through strip S2 and it's strength is so adjusted that galvanometer shows no deflection under this condition the temperature of A and B are the same, i.e, the rate of which heat is supplied to both is same the heat energy is supplied to strip S2 can be calculated from the known value of crosesection of the strip and its absorption coeffiucient, the energy absorbed (or) salar radiation recieved as minutes per square centimeter is. (V.I X 60)/A a .4.2. Hone Salar Constant is given by

$$S.I = \frac{V.I \times 60}{A.a.4.2} \ cal \ cm^{-2} \ min^{-1}$$

where v is voltmeter reading in volts and I is the Ammeter reading

The experiment was performed Several times on the same day where under constant Sky Condition with different elevations of the sun. The average value of solar constant was that calculated by performing the experiment thro-ugh out the year.

The absoreted value of solar constant S and the true value of solar constant So are connected by the reduction

$$S = S_0 \tau \sec z$$

where τ is the transmition coefficient of the atmosphere and z is the zenith distance of the sun (or) angular altitude taking logarithms, we have

$$\log S = \log S_0 + \sec z \log \tau$$

From the experimental data graph is drawn b/w log S on y-axis and sec z on x-axis the graph comes out to be a straight line as shown in fig. The intercept of the straig-ht line on y-axis given the value of $\log S_0$ from this the value of So can be caclu-lated from the value of So comes out to the 1340 Wm^{-2} (1.937) $cal^{-}M^{-1} min^{-1}$ (or) 80400 $Jm^{-2} min^{-1}$)

Result:

The solar constant by using Agstan's pyrheliometer

17/1/22

Experiment No. :

Date : 7/4/22 Page No. : 14

Experiment Name :

Tilt Angle

Aim:

To study the effect of Tilt angle on the effeciency of solar photo voltic panel

Apparatus:

1. Solar panel trainer
2. solar panel setup
3. patch chords
4. multimeter

Procedure:

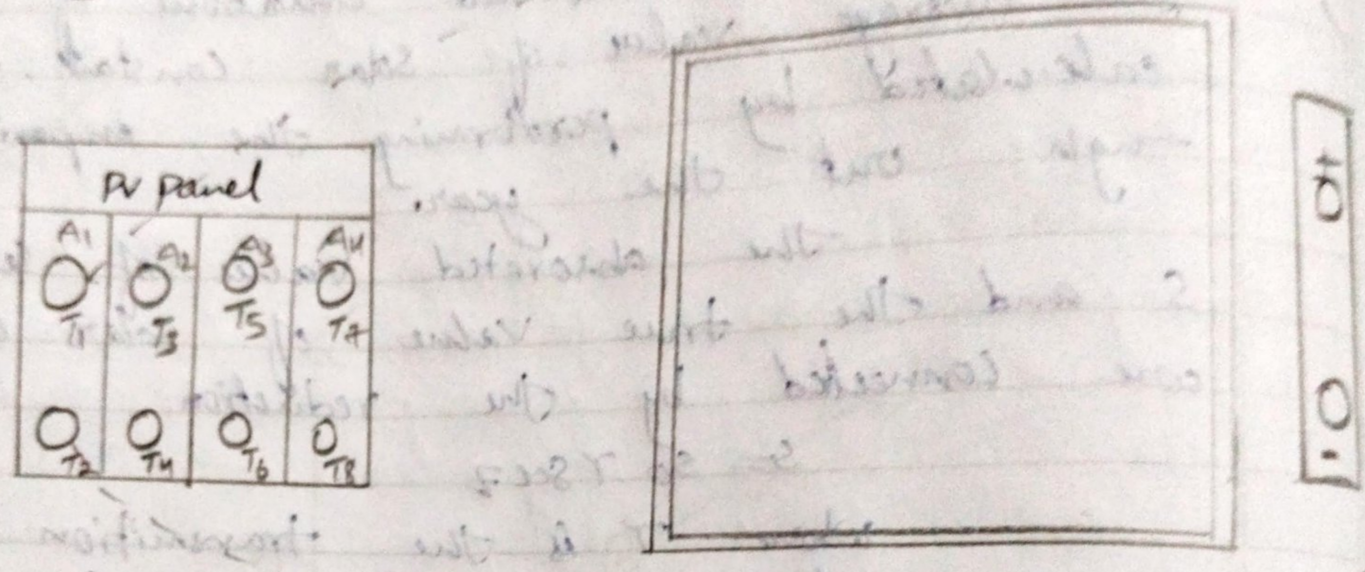
1. Connect the solar panel to the solar panel trainer using a pincable.
2. Switch on the unit
3. Connect the panel input P_1/P_2 to the voltmeter as given in the interfacing diagram.
4. very the source lamp input voltage with the help of intensity volt control unit
5. Repeat the procedure for different load
6. Tabulate the reading.

Result:

Thus the study of Tilt Angle on the efficiency of solar panel was studied.

17/5/22

Interfacing Diagram:



S.No	Tilt Angle	Voltage
1	90°	1.51
2	60°	1.34
3.	45°	1.20
4	30°	1.08

Experiment No. : 3 Date : 16/11/22 Page No. : 5

Experiment Name : photovoltic panel series combination

Aim:

To study the photovoltic panel is series combination

Requirement:

1. Solar panel trainer
2. Solar panel setup
3. patch chords
4. multimeter

procedure:

1. Connect the Solar panel setup to the solar panel trainer using a pin cable.
2. switch on the unit
3. connect $P_1 P_2$ in series as for interfacing diagram.
4. measure the Voltage in digital meters.
5. Tabulate the readings.

Result:

Thus the study on the photovoltaic panel in series combination was studing.

Table:

S.NO	Source voltage (Intensity T_{25}, T_{26})	output voltage (PV Panel)
1.	1.5	13.16
2	2.20	15.55
3	3.0	16.64
4	4.30	16.69
5	5.13	16.96
6	6.30	16.99
7	7.21	17.16
8	8.26	17.25
9	9.18	17.35

Date 5/5/22

Expt. No. 4 Page No. 6

Photovoltic panel in parllel combination

Aim:

To study on the photo voltic panel in parral combination.

Requirements:

1. Solar panel trainer.
2. salar panel setup.
3. patch chords.
4. multimeter

Procedure:

1) Connected the salar panel setup to the Solar panel trainer using 9 pin cable.
2) switch on the unit
3) Connect P_1 P_2 in parllel as for interfacing diagram
4) mearsure the voltage in digital meter
5) Tabulate the reading

Result:

Thus the study on the photo voltaic panel in parllel combination was studed.

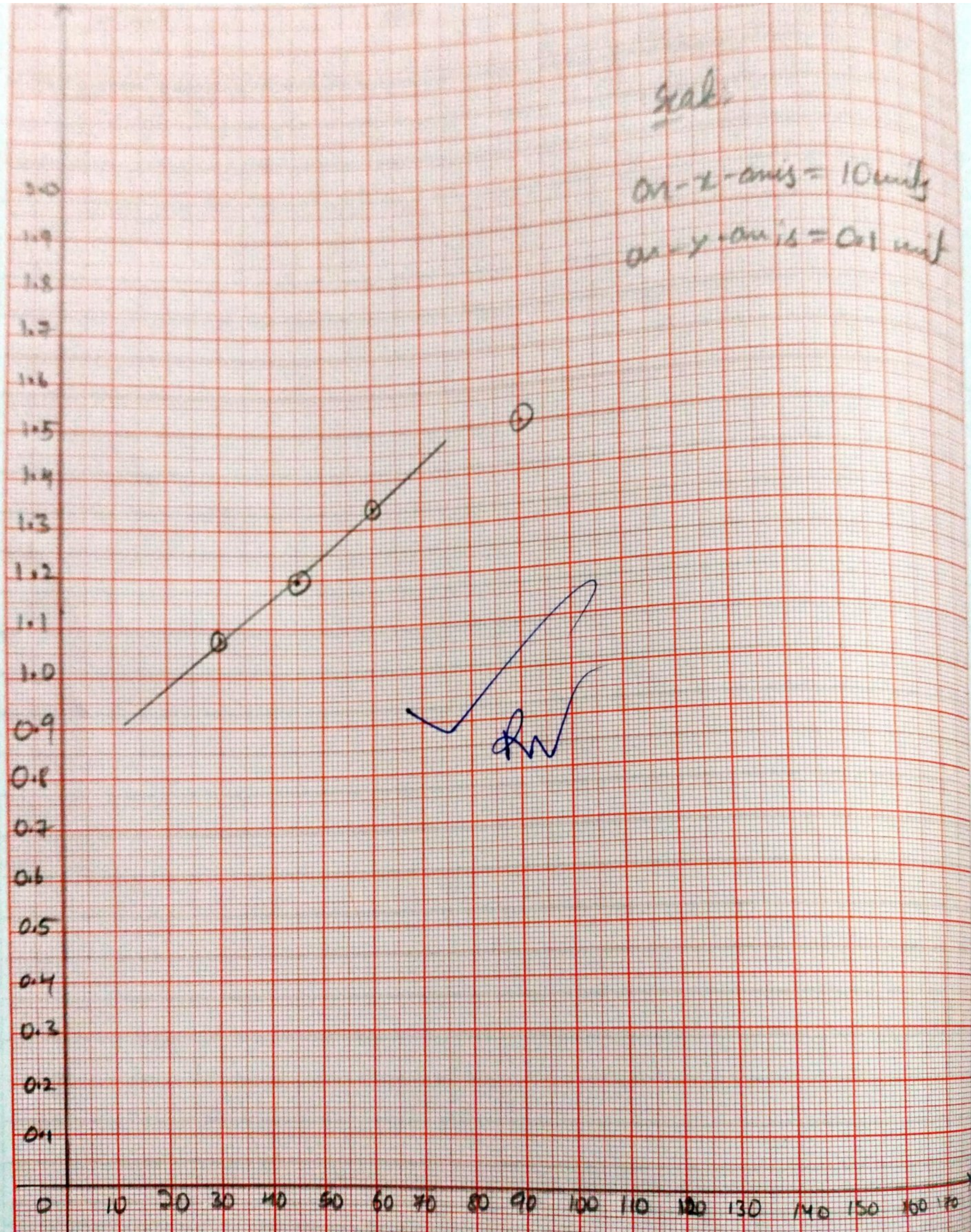
Rw 17/5/22

Tabulation:

Source Voltage (intensity T25, T26)	out put Voltage (PV panel)
0.5	3.9
1.6	4.07
2.0	4.56
3.1	4.96
4.2	5.0
5.2	4.83
6.0	4.93
7.7	5.01
8.2	5.01
8.5	5.01

Tilt angel the solar photovoltaic panel

S.No	Tilt Angel	Voltage
1	90°	1.51
2	60°	1.34
3	45°	1.20
4	30°	1.08


Scale
on x-axis = 10 units
on y-axis = 0.1 unit
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170

Experiment No...........

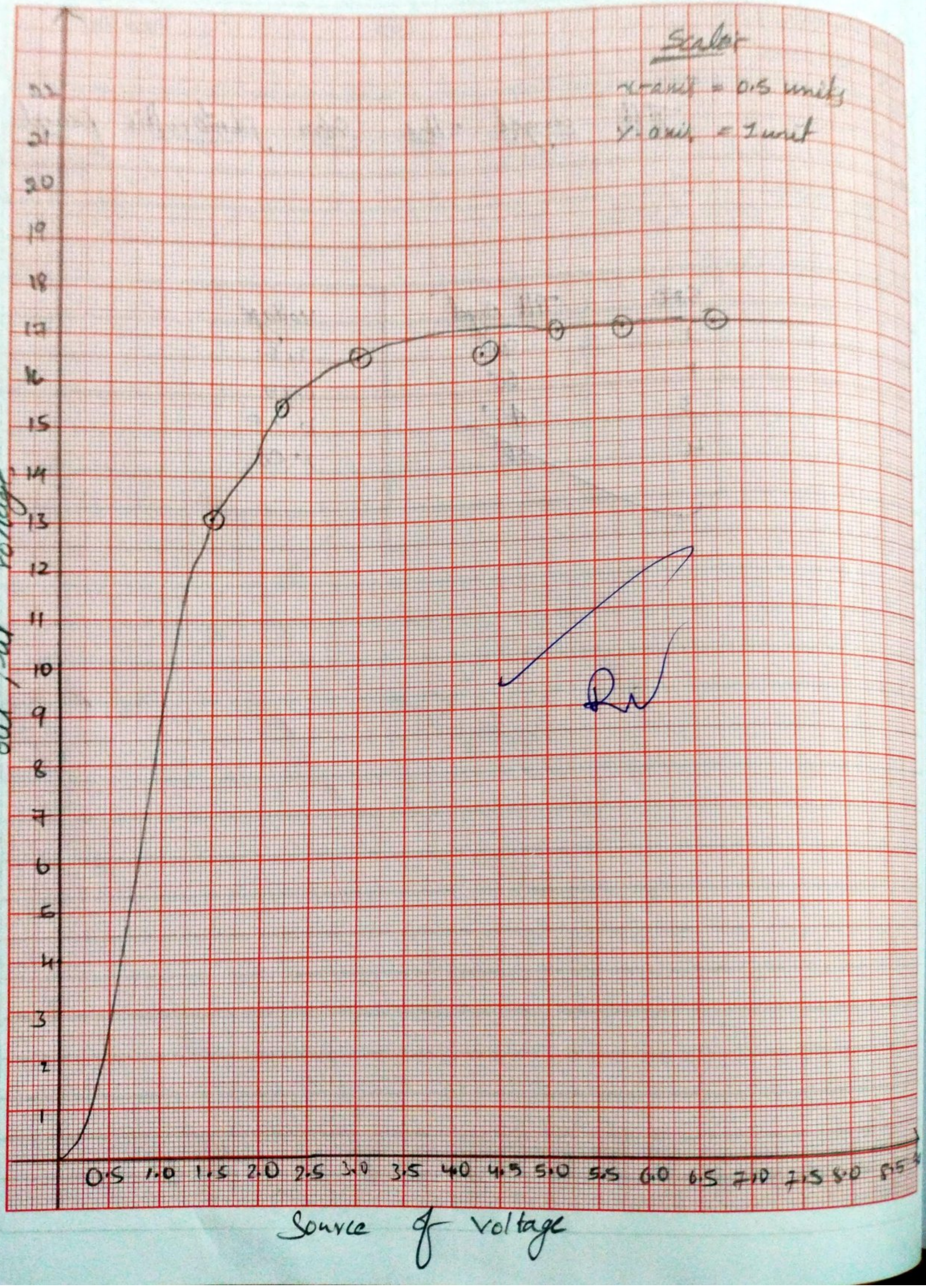
Experiment Name.................

Date :

Page No :

Photovoltic Series combination

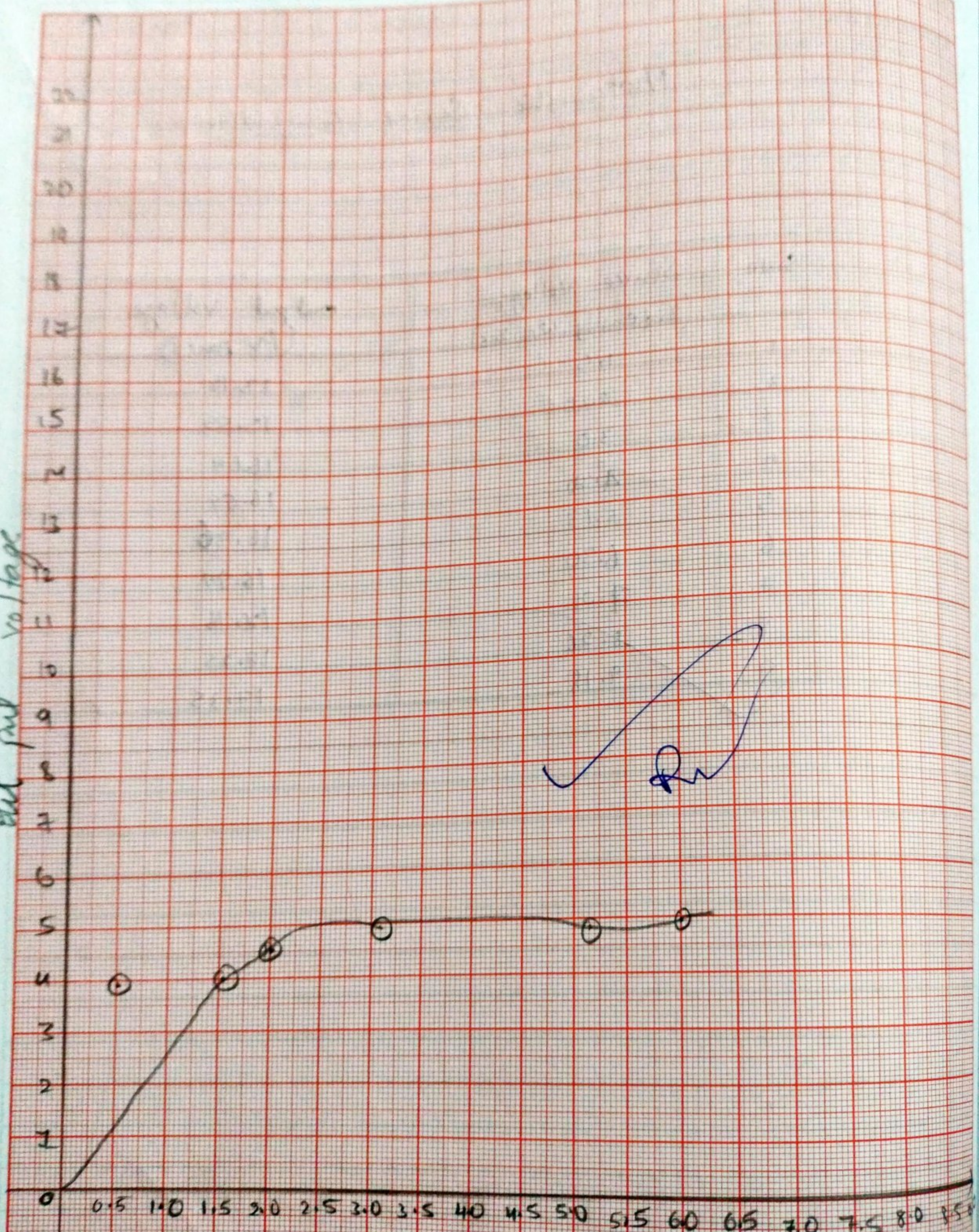
S.NO	Source Voltage (Intensity T25, T26)	output voltage (PV panel)
1	1.5	13.16
2	2.20	15.55
3	3.0	16.64
4	4.30	16.69
5	5.13	16.96
6	6.30	16.99
7	7.21	17.16
8	8.26	17.25
9	9.18	17.35



Scale:
x-axis = 0.5 units
y-axis = 1 unit
out put voltage
Source of voltage
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Photovoltaic Panel Parllel combination

Source voltage (Intensity T25, T26)	output voltage (PV Panel)
0.5	3.9
1.6	4.07
2.0	4.56
3.1	4.96
4.2	5.0
5.2	4.83
6.0	4.93
7.7	5.01
8.2	5.01
8.5	5.01


out put voltage
source of voltage
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
1
2
3
4
5
6
7
8
9

Experiment No. : 1 Date : 7/4/2022 Page No. : 1

Experiment Name : Estimation of wind speed using anemometer

Aim:

To estimate wind speed using anemometer

Apparatus;

Anemometer

Theory;

Wind is the horizontal movement of air. The instrument used to measure wind speed is called as anemometer which is an indicator that will spin in the wind. The anemometer ratotor at the Same speed as the wind. It gives a dire-ct measure of the wind

Construction:-

Anemometer has four cups So that it Can move activately measure wind speed. each cup is which is mounted on a central axis. like spokes on a wheel. when wind passes into the cups, they rotate the axis. The faster the wind, the faster the cups sip the spin the axis

procedure;

1. mount (or) hold the anemometer in a in a place that has full access to the wind from all

directions.

2.) while the spins are counted the anemometer should be holded such that the wind is unobstructed.

3.) Record No. of spins per one minute and then per one hours

4.) speed of wind = no. of spins per hour.

Precautions:-

while the spins are counted the anemometer should be holded such that the wind is unobstructed.

Result:-

The wind speed a using the anemometer

7/5/22

Experiment Name : Characteristics of wind Generator.

Aim:

To determine the characteristics of a wind generat-or turbine.

Apparatus:

Anemometer

Theory:

wind turbines are devices that extract power from the wind and convert it into electri-cal power. wind power is a renewable energy source to keep up with the and must be located in a region where wind blows i.e, for from traditional power grids.

wind turbines are typically chara-cterised by the orientation of their axis of rotation.

1) vertical axis wind turbine (VAWT) and
2) Horizontal axis wind turbine (HAWT)

HAWT are the more commonly used type mainly because no VAWT has matched the effeciency of HAW dill data

wind turbine characteristics are prese-nted a power performance for as shown in fig.

Cut in speed:

At a very law wind speed there is

is insufficient torque exerted by the wind on the turbine blades to makes them rotate. However as the speed increases, the wind turbine will high to rotat and generate

Typical wind turbine power output with Steady and speed.

power extraction from air by the wind turbine

$$P = 2 \rho A d v_0^3 a (1-a)^2$$

electrical power the speed at which the turbine first starts to rotate and generate power is called the cut in speed and is typically b/w 3 and 4 meters per second

Rotate out put power and rated out put wind Speed

As the wind speed raises a bove the cut in speed, the level to electrical out put power Series raises rapidly as shown However typically Somo where between 12 and 17 meters per second The power out put matches the limit to the generator out put in called the rotated power out put and the wind speed at which it is reached is called the rotated out put speed.

cut out speed

As the speed increass above the rate output wind speed the forces on the turbine structure contiue to damage to the rotor. As a result a breaking system is emplyed to blind the motor to a stand still, then is called the output speed and usually arround 25 meters per second.

wind turbine and efficiency (or) power Coefficient

power Coefficient is defined as

$$C_p = \frac{\text{Power entralted}}{\text{power avalable.}}$$

$$C_p = 4 \cdot a(1-a)^2$$

where 'a' is called ants flow induction factor.

Botlz limit :

$$C_p(\text{max}) = 4 \times 1/3 \times 4/9$$
$$= 16/27$$
$$= 0.593$$

the maximum achievable value of Cp is known as Bolt limit and to data-on wind exceeding the limit.

Result:

The characteristics of wind generator has been determined as shown in the figure.

Date 28/04/22

Expt. No. 3 Page No. 07

Vertical and Horizontal Axis Wind Turbine

Aim:

To evaluate the performance of vertical and horizontal axis wind turbine rotors

Theory:

Based on the type of axis used there as are two wind turbine

* Horizontal axis wind turbine (HAWT)
* Vertical axis wind turbine (VAWT)

Both type of wind turbine works on the basic mechanics of the two technologies of simila-r in many respects of the production of electric power The advantages of VAMT are that the accept wind from any direction another merit of this arrangement is that the generator gare box breaks etc can be placed near the ground So that lower doesnot need to support it Hence maintanence efficiency because they do not like advantage of the lesser turbevient and Stronger wind speed available at higher evaluat-ions.

procedure:

The power Curve in the proof at a wind turbine performance

* The power curve of a wind turbine Shows how much electrical power it will produce at different wind speed

* the curve spec can be calculated by knowing the efficiency can be of HAWT and VAWT at different wind speeds
* To verify the power curve the wind speed is measured by an ammeter at hub height and at a suitable distance from the turbine (HAWT and VAWT).
* the power from the turbines is also measure simultanceously.
* During the measurement period all wind speeds have to occur per second specified time from Clean to greater than 25 meters
* the result from these measurements for bothe HAWT and VAWT are entered into a diagram with the wind speed on x-axis power of y-axis shown in figure.

Result:

The power curve which is the proof a wind turbine performance have been drawn from HAWT and VAWT.

17/5/22

Date 5/5/22

Expt. No. 4 Page No. 09

Turbine - Electric power out put (N/P/DH)

Aim:

TO Study the effect of number and Sia of bladies of a wind turbine on electri-c bladed wind.

Apparatus:

most old wind mills they have four blades, wind turbine two blades wind turbine, three bleded turbine with multi bladed wind turbine and three bladed turbine with different dimeensions.

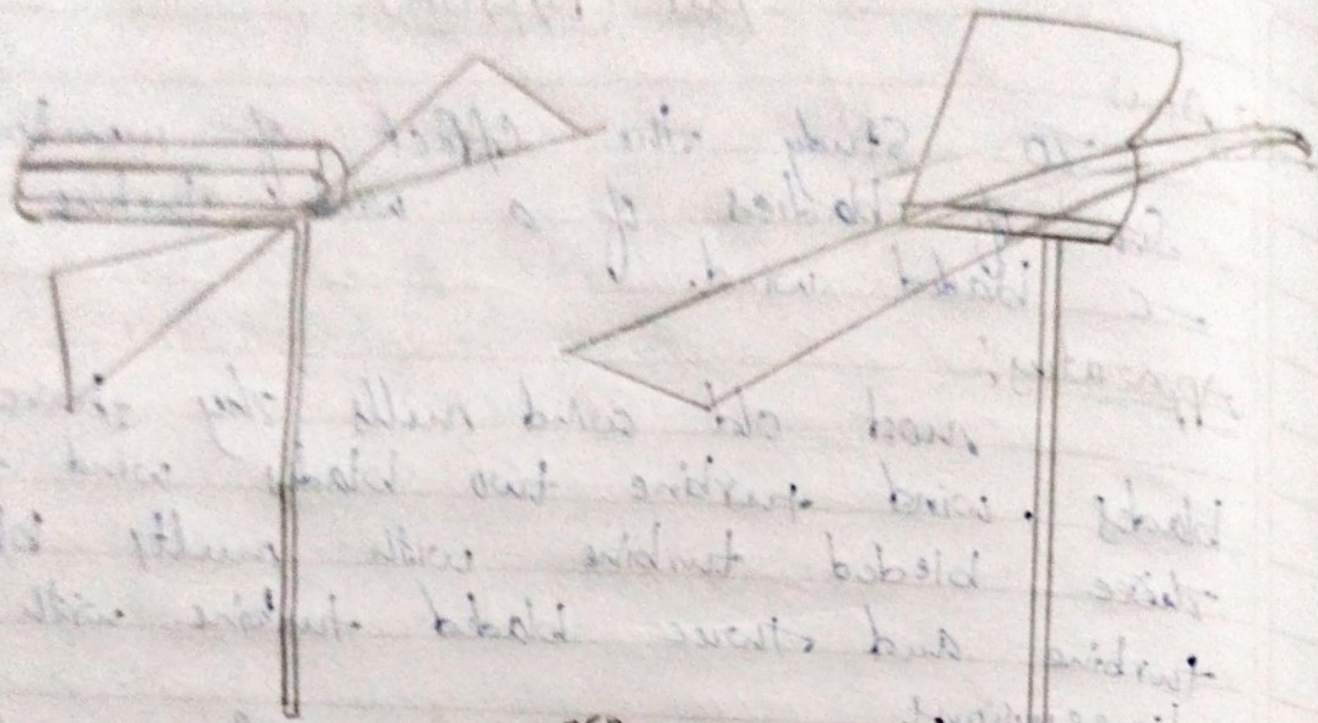
most old mils have four reatangular blades that covers above 20% of Swept are madern wind turbine use three sunded blads that cover not more than 3-4 percentage of swept areal but they are much more effective then their predecsors.

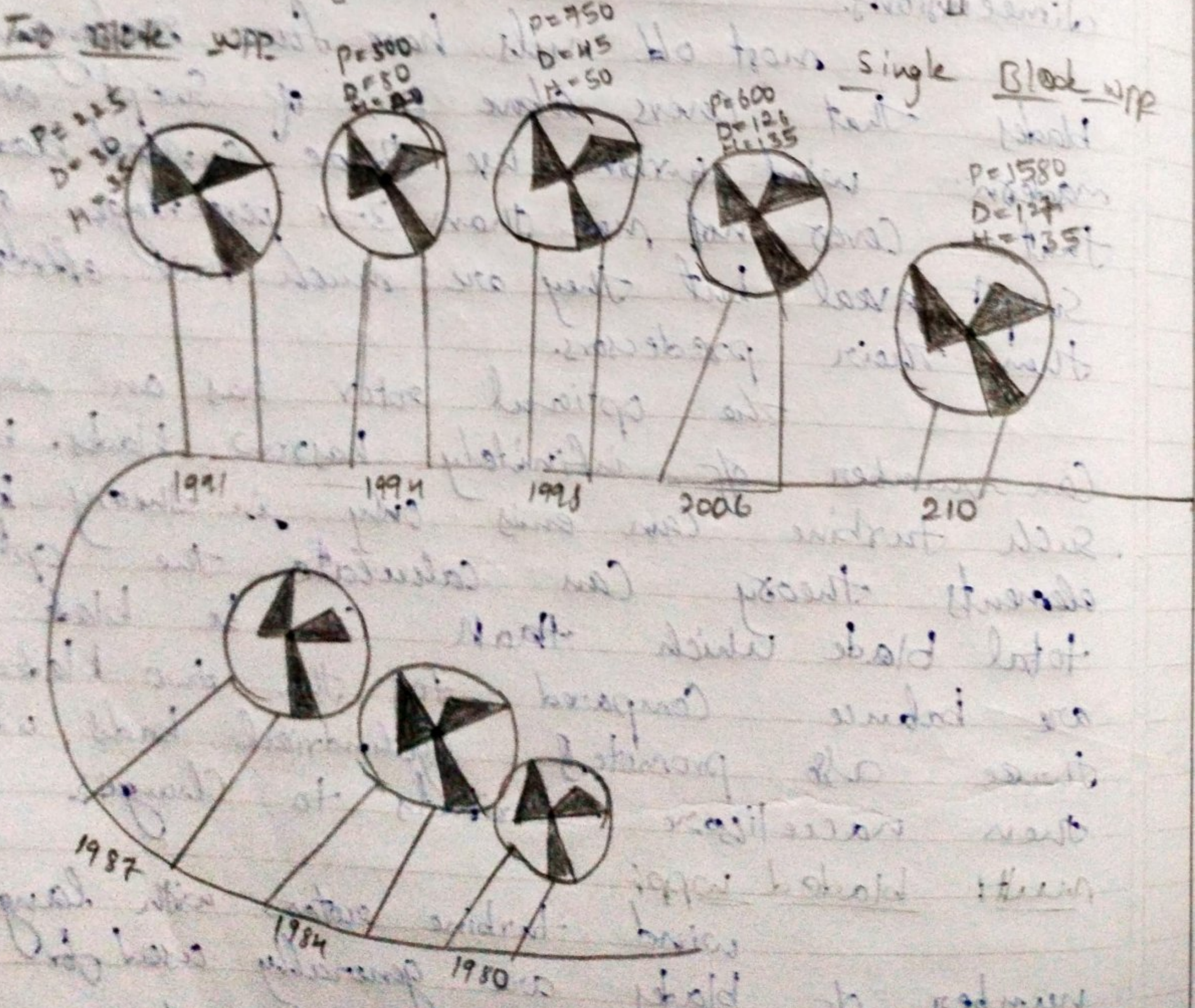
the optional rotor has an infinite Can number of infinitely harrow blades. but such turbine can exis only in theory blade elements theory can calculate the optimum total blade which thaan can be blade that are babnce Compared to the two bladed three also promotes cyclindrical loads when then naccelisore - orients to Changes.

multi bladed wpp:

wind turbine rotoos with large number of blades are generally used for water pumfing wind mills. these wind machines are hot

Excellent





Two blade wpp
Single Blade wpp
P=225
P=500
P=750
D=45
H=50
P=600
D=126
H=135
P=1580
D=127
H=135
1991
1994
1998
2006
210
1987
1984
1980

used for electric power producting
used the higher rotational speed is needed to get the same efficiency for turbine with same rotor diameters two blades turbine need high rotational speed then three bladed turbine and so on.

one blade wpp:
For smother rotation it requires a counter weight for balancing but at the same time it is also creats rise it require a relatively higher wind speed than that need by three bladed wpp to produce same powers output However a Spanish manifucture its marketing innovative of the one bladed procedure wpp in the range of 60 KW to 335

Two bladed wpp=

A two rotor to which two bladed has to spin faster to perform the same amount of work as a three blade rotor higher rotor speed translate into capture same energy as a Three bladed region can be do.
Three bladed wpp:
three blades effectively estinouts gyreascope in.

power rating of WPP:

The nominal power rating of wpp have increased drastically with each new generation and their sizes have increased as well today the maximum capacity of a single commercially produced wpp stands for at 7.58 watts over the years based on the power ranges the dimensions and hub heights.

Result:

The effect of numbers and size of blades of a wind turbine on electric power output.

Experiment No. : 01. Charge And Discharge character Date: Page No. 1

Experiment Name : Stues of A Stroage Battery Date: 30/4/22

Aim:

To Study of charge and discharge charact-eristics of a Storage battery

Requirement:

Solar panel manuer
Solar panel setup
patch churds

procedure:

* Connect the solar panel setup to the Solar trainer using a here table
*. switch on the unit
*. switch SWI Should be in charge mode
* Connect T_1 and T_2 to the charges circuit and T_{18}
*. we can monotor the battary voltage by Volt meter
* After reached 2.K.V by battery volt remove all Patching.
* Charge the switch SWI from charge to load
*. Then Connect T_{15} and T_{16} and T_{22} in this time sun D.C fan moving from the charge in the battery discharges.
* This charging and discharging is reopeated

Result:

This the charge and discharge characteristics of a Storage volt battery was stuhid.

Sm

Charging

Time	voltage
0	0.95
2	0.93
4	0.92
6	0.90
8	0.89
10	0.68
12	0.35
14	0.28
16	0.24

dis Charging

Time	voltage
0	9.0
5	10.4
10	11.7
15	12.9
20	13.9
25	15
30	16.2
35	17.3

Experiment No. : 02 charge And discharge Characte Date : Page No. : 2

Experiment Name : -ristics of A storage capacitor

Date: 7/5/22

Aim:

To study the charge and discharge Character -istics of a storage capacitor.

Requirement:

Solar panel trainer
solar panel setup
patch chords

procedure:

*. Connect the solar panel setup to the solar panel trainer using 9 pin Cable
*. switch on the unit.
*. switch SWI should be in charge mode
*. maximum the intencity control regular
*. Connect T_1 and T_2 to T_{27} and T_{28} to charge the Capacitor
*. charge the switch SWI from charging to discharging
*. Now the discharging LED will glow to discharge the Capacitor storage.
*. After Charging the capacitor remove as patching
*. connect T_{29} and T_{30} to T_{11} and T_{12} to monito the charging volt of capacitor.
*. this charging and discharging is repeated

Result :

Charging

Time	Voltage
5	10.59
10	12.56
15	13.6
20	16.51
25	17.63
30	18.10
35	18.22
40	18.31
45	18.36
50	18.34
55	18.32
60	18.31
65	18.29
70	18.27

dis charging

Time	Voltage
5	1.57
10	1.57
15	1.53
20	1.52
25	1.52
30	1.51
35	1.51
40	1.50
45	1.50
50	1.47
55	1.48
60	1.46
65	1.47

ment Name :

This the study of charge and discharge characteristics of a storage capacitor was studied.

Experiment Name : Charge And Discharge Characteristics of A Ni - cel Battery

Aim:

To study of charging and discharging characteristics of Nickel - calmoum battery using solar photo voltic cel.

Requirement:

* Solar panel trainer.
* Solar panel setup
* petch chords

procedure:

* connect solar panel set up to the solar panel trainer using 9 pin cable
* switch on the unit
* switch SWI should be in charge mode
* maximum the citensity control regulator
* Then connect T_{19} and T_{20} to T_{11} and T_{12} in this time our battery gets charged
* we can monitor the battery voltage by voltmeter
* After reached 2.4V of battery volt remove all patching
* Charge the 50 switch SWI from charge to road.

Charging

Time	Voltage
0 sec	2.09
30 sec	2.10
1 min	2.11
1.30 min	2.12
2.0 min	2.13
2.30 min	2.14
3 min	2.14
3.30 min	2.14
4. min	2.15
4.30 min	2.16
5. min	2.17
6. min	2.17
7. min	2.18
8. min	2.18
9. min	2.18
10. min	2.19
11. min	2.20
13 min	2.21
18. min	2.22
21. min	2.22

Time	Voltage
0 sec	2.19
1.0 sec	2.17
20 sec	2.15
30 sec	2.14
1 min	2.12
2 min	2.10
3. min	2.08
4. min	2.02
5. min	2.06
6. min	2.05
7. min	2.05
8. min	2.04
9. min	2.04
10. min	2.02
11. min	2.02
12. min	2.03
15 min	2.00
20 min	1.98
21.	1.98

* Then connect T_{15} and T_{16} to T_{21} and T_{22}, in this time our D.C for runs from the charge in the battery
* This charging and discharging is repeated

Result:

Thus the study of charge and discharge characteristics of a s nickel-cadmium gas studied.

Solar cooker

Aim:

To Test the perfomance of solar Cooker

formula:

$$p = \frac{(T_2 - T_1)}{t} ms$$

where p = power
m = mass of water =
s = specific heat of water
and $T_2 - T_1$ = difference in Temperature
t = time of Heating (sec)

principle:

the principale innoled in working of Solar cooker Can be enplained by the for following 3 points

(1) Concantraling sun light:

A marrared surface with height / pendar reflecting is used to Concentrate light small cooking area.

2. Connecting light energy to Carit energy

Solar cookers concentrate sun light into a recencer swich on a cooking pan conneents light to heat.

S.NO	mass (gm)	T_1 (0c)	T_2 (°c)	$P = \frac{(T_2 - T_1) ms}{900}$
1		27	35.5	16.802
2		35.5	40	8.895
3		40	44	7.906
4	425	44	48	7.906
5		48	51	5.930
6		51	52	1.976
7		52	53	1.976
8				

S.NO	Time	T_1 (°c)	T_2 (°c)	$P = \frac{(T_2 - T_1) ms}{900}$
1	9.40	27	35	15.813
2	9.55	35	34	1.976
3	10.10	34	32	3.953
4	10.25	32	34	3.953
5	10.40	34	34	0
6	10.55	34	35	1.976
7	11.10	34	34	1.976

3. Traffing heat energy:

It is important to reachance Convention by is chating air ensite the cooker from our the cooker

Description:

The reflectance of the solar cooker genera high temperature our cool quickly out require bregnent ads ustment and suctoraisin for safe oberation.

The cooking vessel is cooted at the forms which on the axis of rotation, so the mirror concentrates sun light onto it all the day the mirror, has to la accesionally fitted about a particular axis to complass state for the lay vaonortal thus ter axis closes not pass through the cooking vessel To keep the form stationary the reflections should has to vary.

Some times the rotating reflector is losated out doors and the reflecting sun light passes throught an change on a well into an are, where the cooking is done

Working:

the container of food is placed inside the solar cooker which may be elemented on a luck vental tirment on either heat sun. and the solar cooker is placed on direct sun light reflecting on the sere of the solar angel the minutes and mantly of cooker foods.

A solar oven is formed towards the sun and left untill the food is cooked; unble cooking on a stoke or over a time not stored or turned over bothe becane it is unnecessary and the become off heng the solar even allows the to escale.

the cooking time chatter dehends primarily on the equipment being used the amt of sun light at the time the quality of food that attitude also effect are the kate after root

Advantages of solar cooker

1. Hight performance solar cooker can be attance temperture alove 2u°c (550°c)

2 connentional solar cooker attance temparature what 165°c they can stoirlike water cor prefare most foods that can be mode an a connentinal

Date ....

Expt. No. ....   Page No. 9

over on store

(3) when solar cooker enmmental und badsulectry do not contribute consule heat, prtentially sarry as well

Result:

The power of the solar cooker is given by

$P_1 =$

$P_2 =$

Experiment No. 1

Date :

Page No :

Experiment Name: Charge and discharge Characterstic of a storage battery

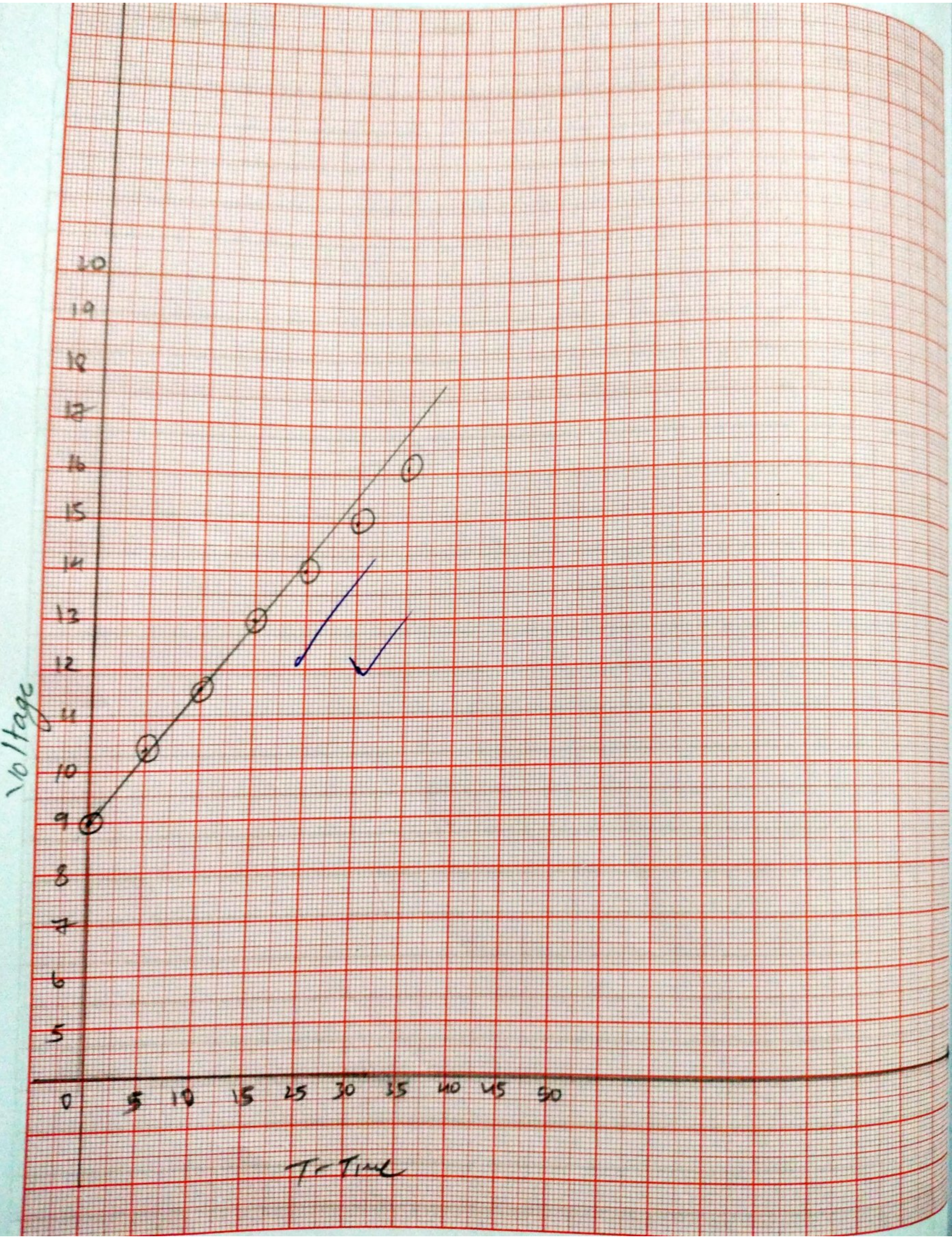
Charge

Time	Voltage
0	9.0
5	10.4
10	11.7
15	12.9
20	13.9
25	15
30	16.2
35	17.3

Scale:

On x-axis 1unit = 5 sec

on y-axis 1unit = 1V



Voltage
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
0
5
10
15
25
30
35
40
45
50
T-Time

Experiment No............ Date : Page No :

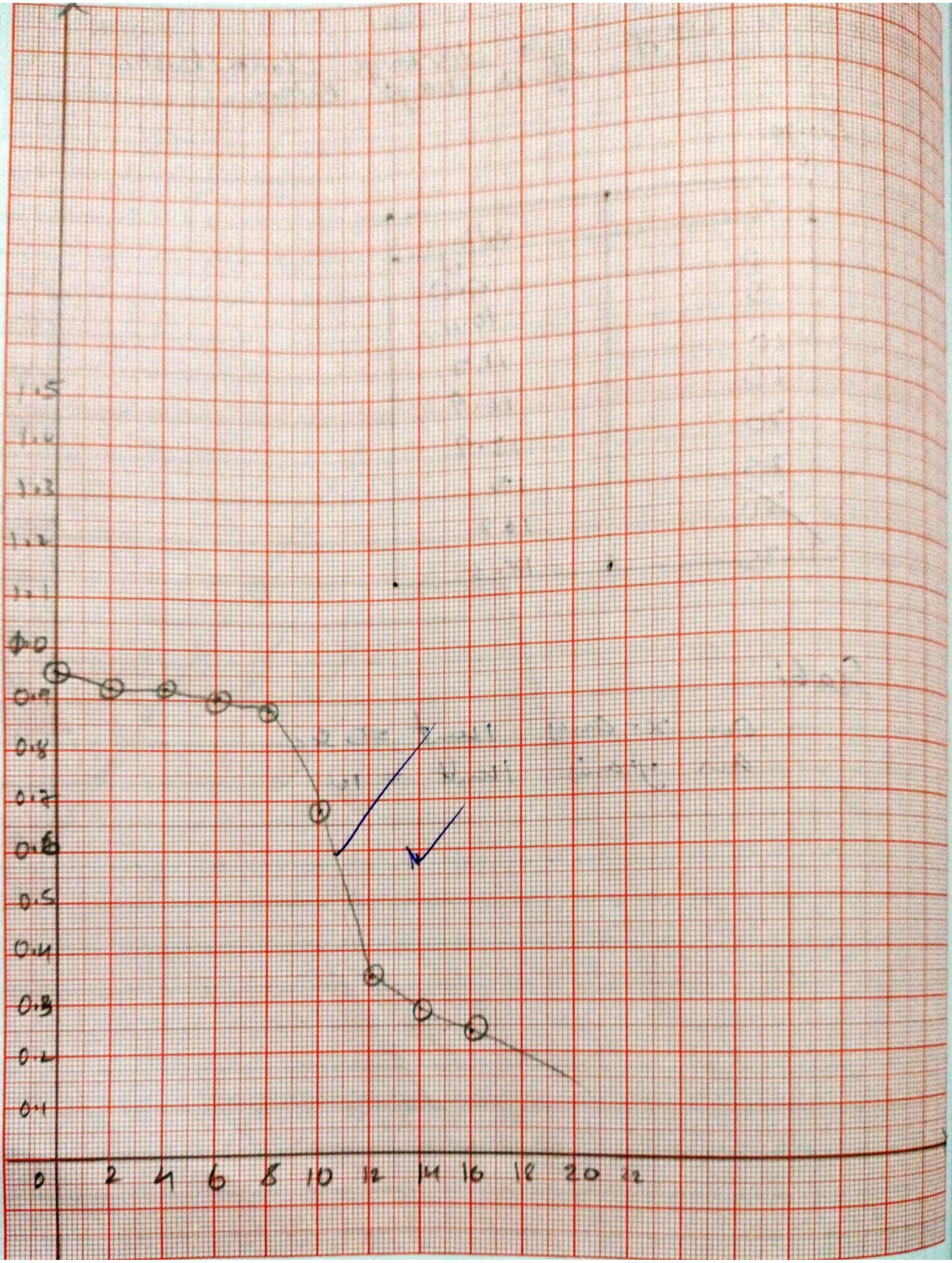
Experiment Name...................

discharge

Time	Voltage
0	0.95
2	0.93
4	0.92
6	0.90
8	0.89
10	0.68
12	0.35
14	0.28
16	0.24

on x-axis 1unit = 2sec

on y-axis unit = 0.1


1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0 2 4 6 8 10 12 14 16 18 20 22

Experiment No. 2 Charge and Charge of Date :

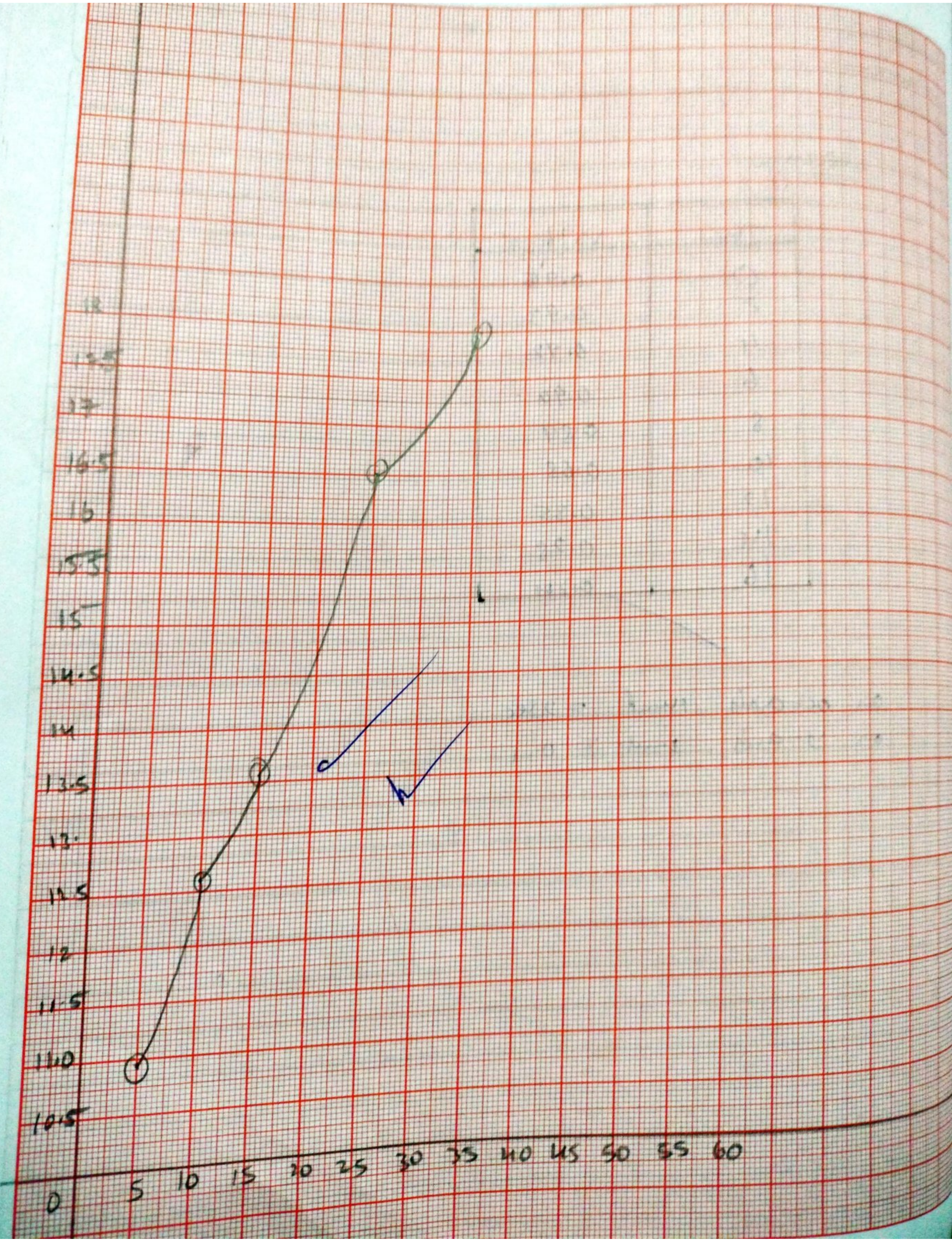
Page No :

Experiment Name Characteristics of a storage capacitor

Time	Voltage
5	10.59
10	12.56
15	13.60
20	16.51
25	17.53
30	18.40
35	18.39
40	18.37
45	18.36
50	18.34
55	18.32
60	18.31
65	18.29
70	18.27

On x-axis 1 unit = 5 sec

on y-axis = 0.5V


18
17.5
17
16.5
16
15.5
15
14.5
14
13.5
13
12.5
12
11.5
11.0
10.5
0
5
10
15
20
25
30
35
40
45
50
55
60

Experiment No...........   Date :   Page

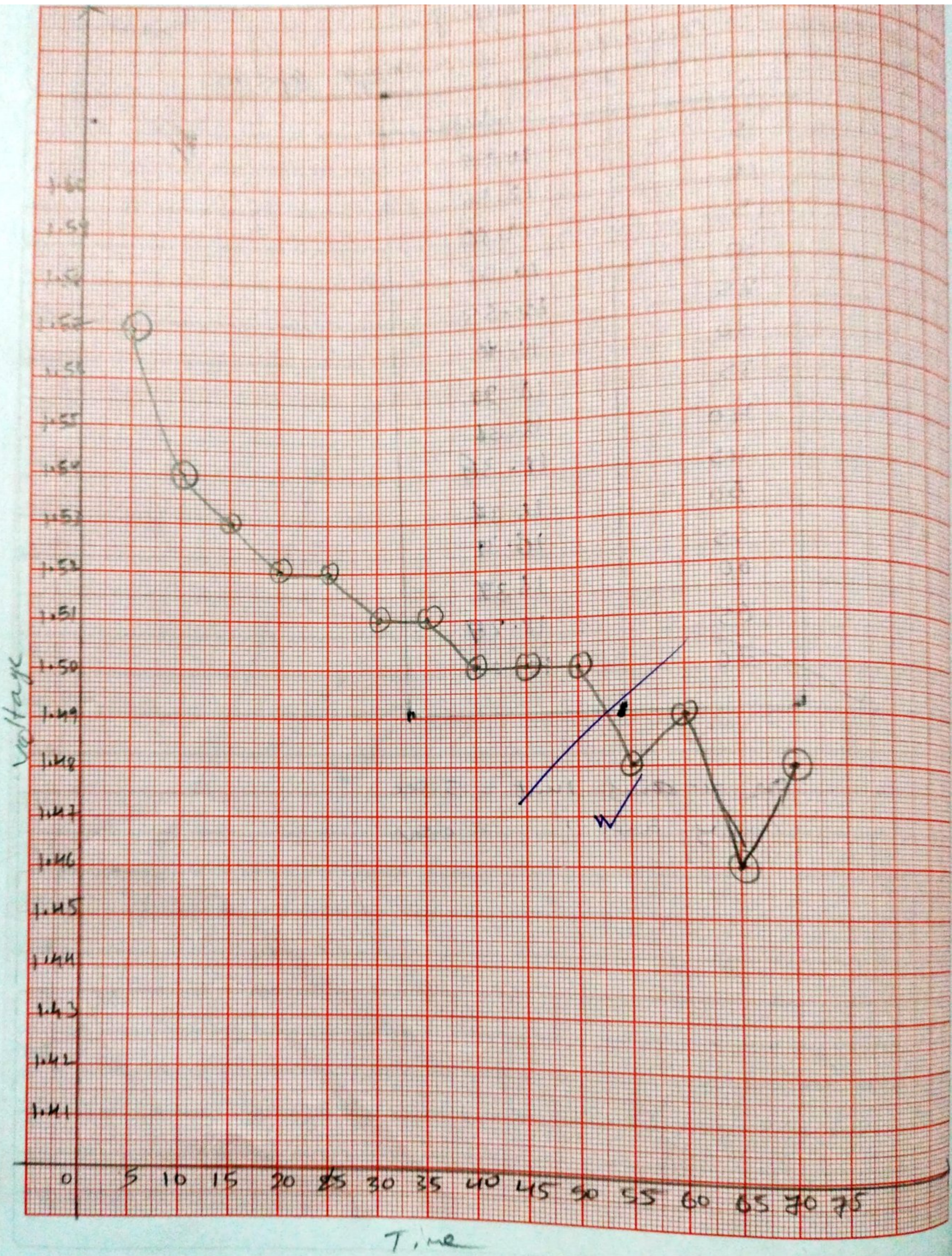
Experiment Name..................

dis charging

time	voltage
5	1.57
10	1.54
15	1.55
20	1.52
25	1.53
30	1.51
35	1.51
40	1.50
45	1.50
50	1.47
60	1.48
65	1.46
70	1.47

on x axis   1 unit = 5 sec

on y axis   1 unit = 0.01V



Voltage
Time
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
1.52
1.51
1.50
1.49
1.48
1.47
1.46
1.45
1.44
1.43
1.42
1.41

Experiment No. 3

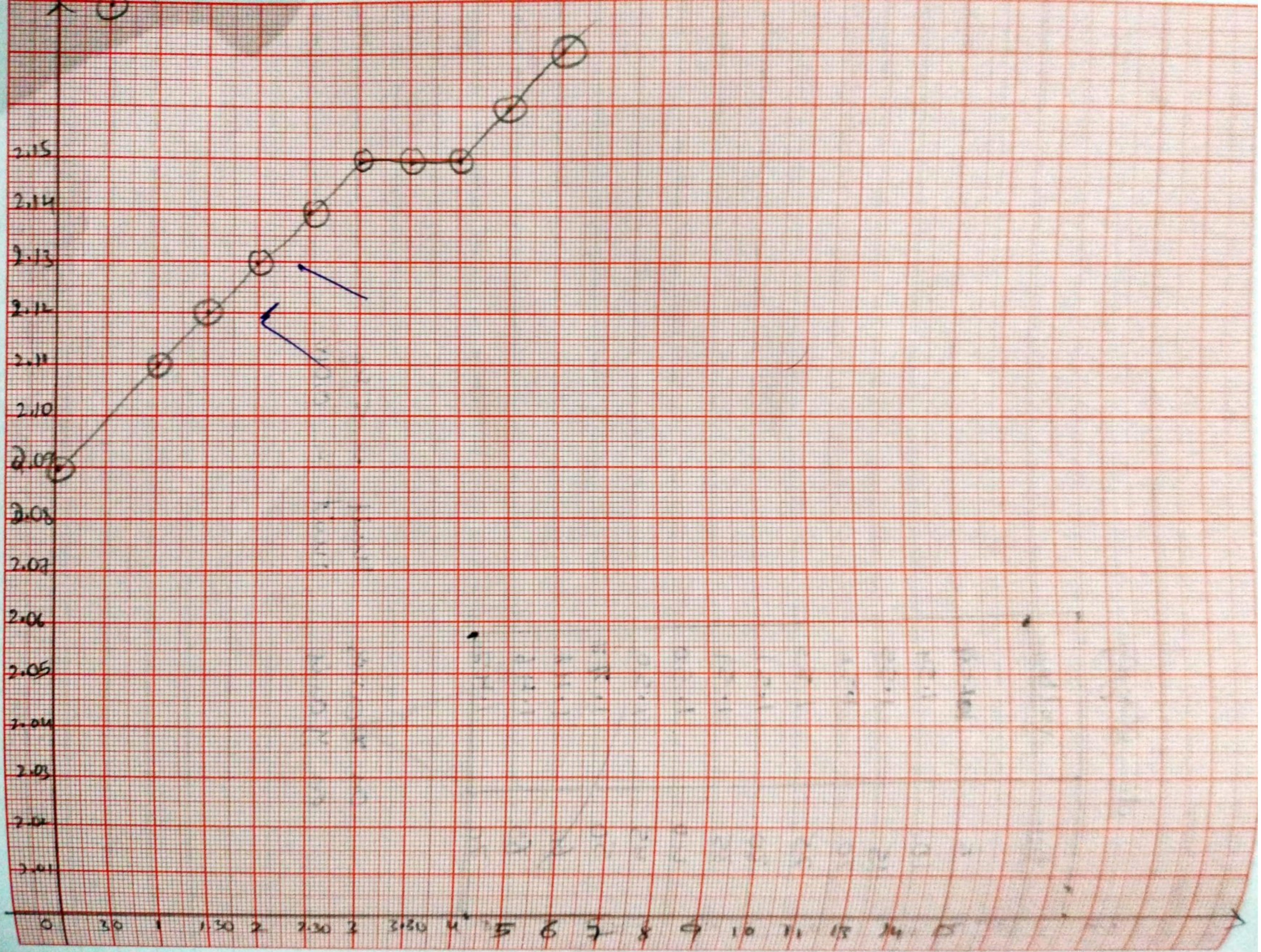
Date :

Page No :

Experiment Name: Charge and discharge to Characteristics of A Ni-cd Battery

Charge:

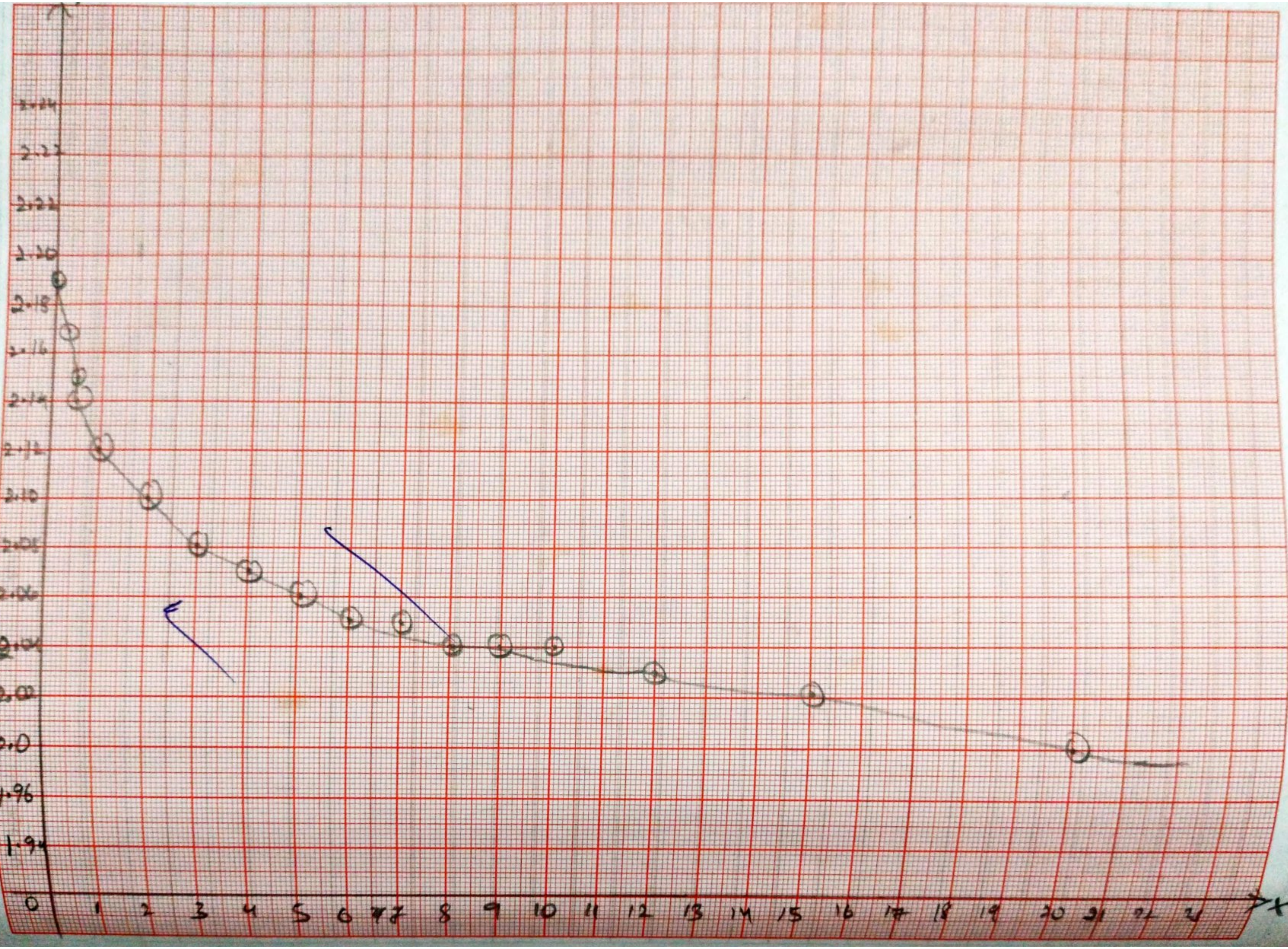
Time	voltage
0	2.09
30	2.16
1	2.11
1.30	2.12
2	2.12
2.30	2.14
3	2.14
3.30	2.13
4	2.14
5	2.16
6	2.15
7	2.15
8	2.16
9	2.18
10	2.18
11	2.18
12	2.19
13	2.21
18	2.22
21	2.23


2.15
2.14
2.13
2.12
2.11
2.10
2.09
2.08
2.07
2.06
2.05
2.04
2.03
0
30
1
1.30
2
2.30
3
3.30
4
5
6
7
8
9
10
11
13
14
15

Experiment No.......
Date :
Page No :
Experiment Name..................

discharging

Time (sec)	Voltage (Volts)
0sec	2.19
10	2.17
20	2.15
30	2.14
1min	2.12
2	2.10
3	2.08
4	2.02
5	2.06
6	2.05
7	2.05
8	2.04
9	2.04
10	2.04
11	2.02
12	2.03
15	2.02
20	2.00
22	2.00
23	1.99
24	1.98



2.22
2.20
2.18
2.16
2.14
2.12
2.10
2.0
1.96
1.94
0
1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
17
18
19
20
21
x