IARE
INSTITUTE OF AERONAUTICAL ENGINEERING
(An Autonomous Institute affiliated to JNTUH, Hyderabad)
Dundigal, Hyderabad - 500 043

LABORATORY WORK SHEET

Name of the Student : Abdul Basith Khan

Class: 1st Year (CSM-A) Semester: Ist

Course Code : AEED01 Course Name : EEE Laboratory

Roll Number									
2	3	9	5	1	A	6	6	0	1

Name of the Course Faculty: Dr. L Rajashekhar Goud Faculty ID : IARE11067

Exercise Number : 08 Week Number : 08 Date : 17/01/2024

DAY TO DAY EVALUATION:

Marks	Aim / Preparation	Algorithm / Procedure Performance in the Lab	Source Code Calculations and Graphs	Program Execution Results and Error Analysis	Viva - Voce	Total
Max. Marks	4	4	4	4	4	20
Obtained	4	4	4	3	4	19

Signature of Faculty

START WRITING FROM HERE : Swinburnes Test :-

Aim:-

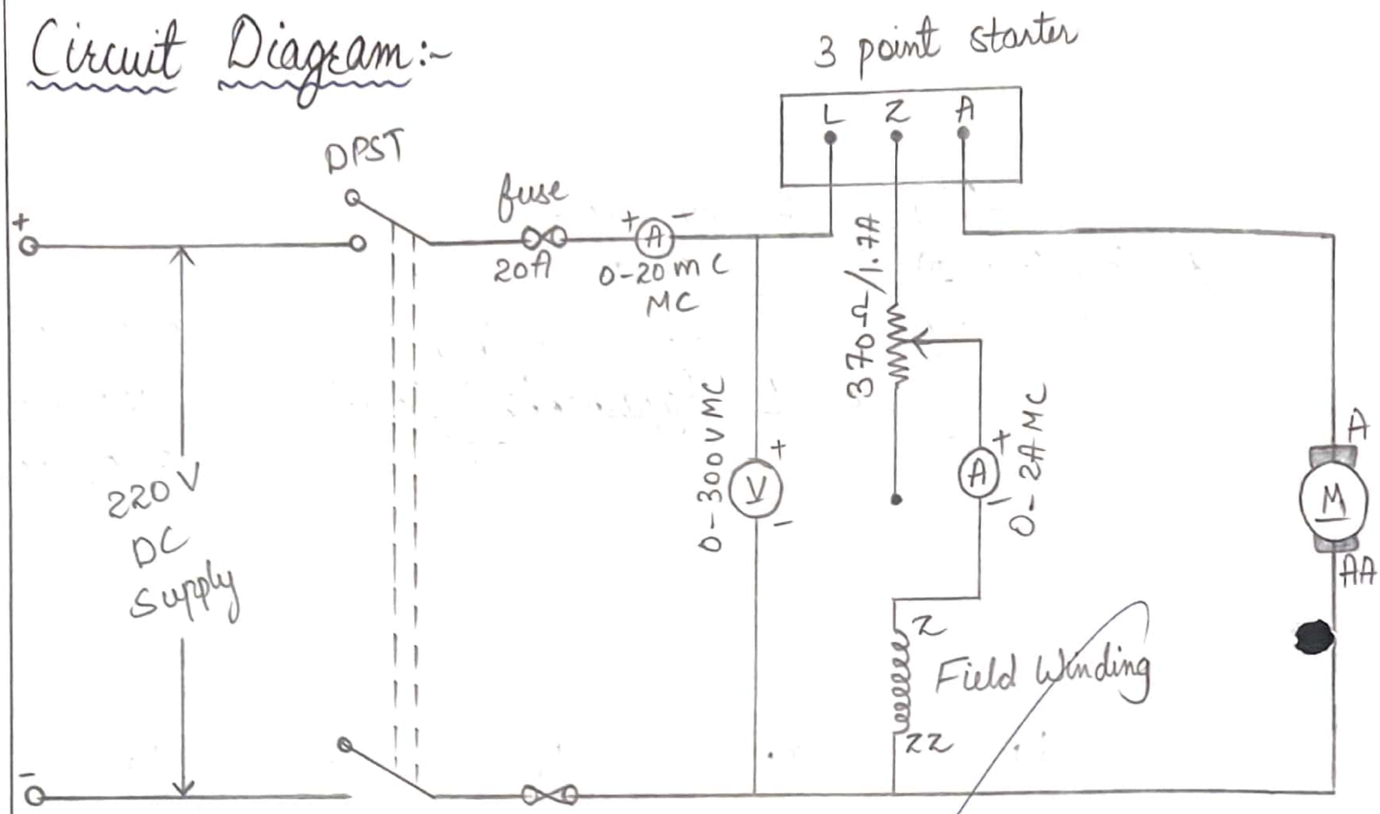
Pre-determine the efficiency and constant losses of a DC shunt machine by Swinburnes Method.

Apparatus:-

S. No	Name of the Equipment	Type	Range	Quantity
1.	Ammeter	MC	0-20 A	1
2.	Voltmeter	MC	0-300 V	1
3.	Ammeter	MC	0-2 A	1
4.	Rheostat	Wire wound	370 Ω / 1.7 Ω	1
5.	Connecting Wires	-	-	-

ROLL NUMBER :

Circuit Diagram:-



Swinburne's test on DC Shunt motor.

Name Plate Details:-

Motor.

Voltage	230 V
Current	19 A
Output	5 Hp
Speed	1500 rpm

Procedure:-

1. Choose the proper ranges of meters after noting the name plate details of the given machine and make the connections as per the circuit Diagram.
2. Keep the motor field rheostat (R_R) in the minimum start the motor by choosing the switch and operating the starter slowly.

ROLL NUMBER :

3. Run the motor at rated speed by adjusting the motor field rheostat.

4. Note down the voltages no load current and field current calculation for Swinburnes test:-

from the no load test results

supply voltages = V_L Volts

No load line current = I_L Amperes

field current = I_f Ammperes

Therefore No load armature current = $I_{a0} = I_L - I_f$ Amperes

rmature Resistance = R_a : $R_a = 1.25$ ohms

No load Copper Losses are = $I_{a0}^2 R_a$

No load power input = $V_L I_L$

Constant Losses = (No load power input - No load Copper losses)

Tabular Column:-

S. No.	V (Volt)	I_{Lo} (Amp)	I_f (A)	Speed (rpm)
1	230	1.4	0.7	1500

$R = 1.25\Omega$

As a motor Rated Voltage $V_L = 2$~~30~~

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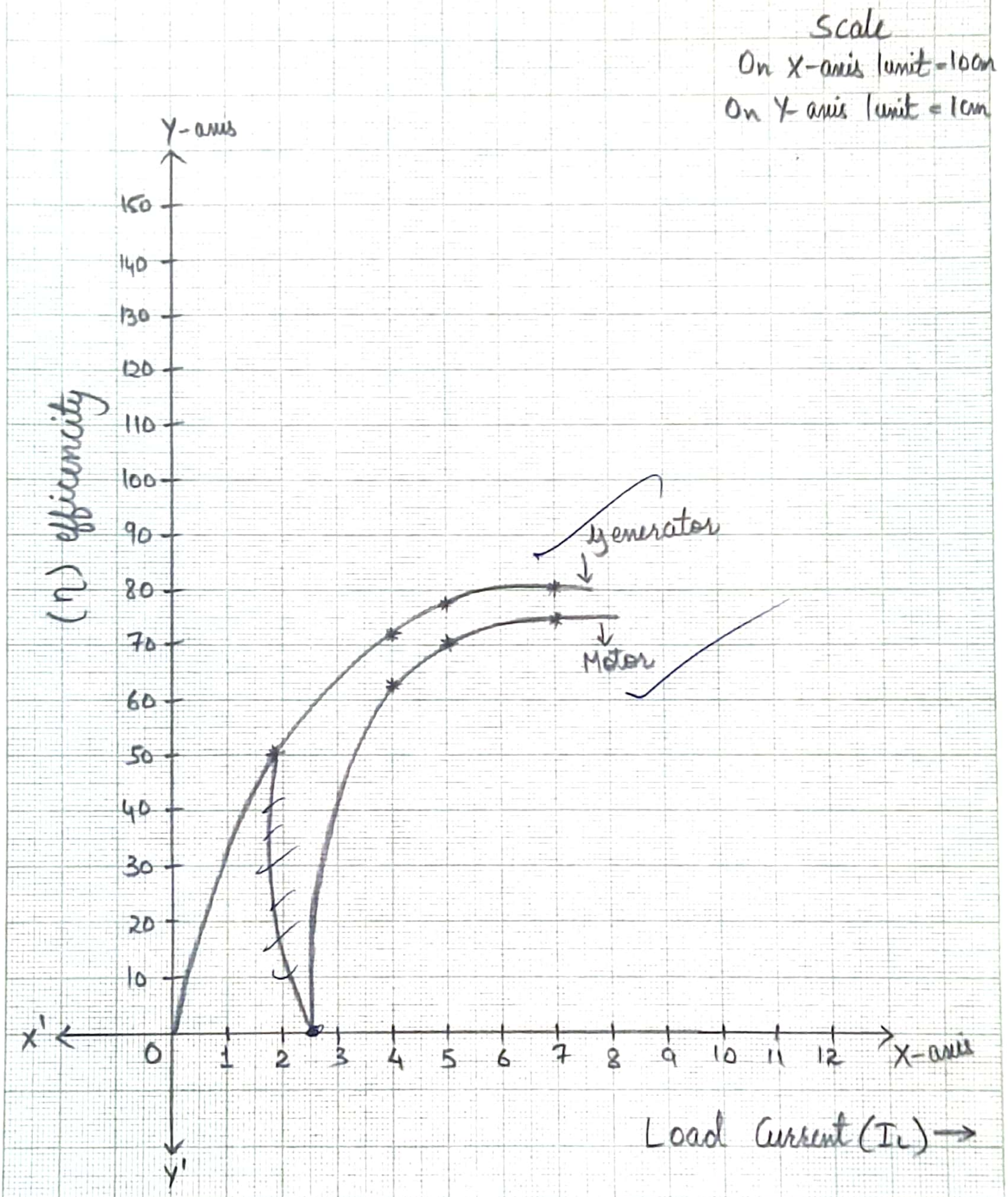
Sl No.	Volt S.No. (V)	I_L (A)	I_f (A)	P_C Input Power ($V_L - I_L$) (Watt)	W_c Constant Loses (W_{const}) Watts	Copper losses $W_{cu} = I_a^2 R_a$ (W)	Total Losses ($W_{const} + W_{cu}$) (W)	O/P Power = (I/P - Total losses) (W)	$P_o = VI_L - W_c - I_a^2 R_a$ $\frac{P_o}{P_i} \times 100$ η%
1.	230	1.4	0.7	322	321.4	0.61	322	0	0
2.	230	2	0.7	460	321.4	2.11	323.51	136.49	29.67
3.	230	4	0.7	1920	321.4	13.61	335.61	584.39	63.8
4.	230	5	0.7	1150	321.4	23.11	344.51	805.49	70.04
5.	230	7	0.7	1610	321.4	49.61	371.01	1238.5	76.92

As a Generator Rated Voltage $V_L = 230$

Sl No.	Volt S.No (V)	I_L (A)	I_f (A)	Output Power ($V_L \cdot I_L$)	Constant losses W_{const}	Copper losses $W_{cu} = I_a^2 R_a$	Total losses ($W_{const} + W_{cu}$)	Input power (output Power losses)	η
1.	230	1.4	0.7	322	321.4	5.51	326.91	648.91	49.6
2.	230	2	0.7	460	321.4	9.11	330.51	790.51	58.19
3.	230	4	0.7	920	321.4	27.61	349.01	1269.01	72.49
4.	230	5	0.7	1150	321.4	40.61	362.01	1512.01	76.05
5.	230	7	0.7	1610	321.4	74.11	395.51	2005.51	80.3

Abdul Basith Khan 23951A6601

AEED01 Week - 08 1st Year CSM-A



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START WRITING FROM HERE :

Efficiency as Motor:-

Efficiency = output / input = (input − total losses) / input

Where total losses = Constant losses + Variable losses

Constant losses are known value from the equation 1

Variable loss = $I_a^2 R_a$ where $I_a = I_L - I_f$

Input = $V_L I_L$ V_L is rated voltage of the machine, Assume line currents (I_L) as 2, 4, 6, ... 20A and find corresponding efficiency

Efficiency as Generator:-

Efficiency output / input = output / (output + total losses)

where losses = constant losses + variable losses.

Constant losses are same for both motor and generator

Armature current, $I_a = I_L + I_f$

Variable loss = $I_a^2 R_a$

Output power = $V_L I_L$. V_L is rated voltage of the machine

Assume load current (I_L) as 2, 4, 6, ... 20A and find corresponding effeciencies.

Calculations:-

$V_{IN} = 230$, $I_{Lo} = 1.4$, $I_f = 0.7$

Speed = 1500 rpm

No-load Input $= V_{in} I_{Lo}$

$= 230 \times 1.4$

$= 322$ W

$I_a = I_L - I_f = 1.4 - 0.7 = 0.7$

$R_a = 1.25 \Omega$

Variable losses $= I_a^2 R_a$

$= (0.7)^2 \times 1.25$

$= 0.61$

No load input = Constant losses + Variable losses (Cu)

$W_c = V_{IN} \cdot I_{Lo} - I_a^2 R_a$

$W_c = 322 - 0.6$

$W_c = 321.4$ W

Rated current = 11 A
Assuming $I_L = 1.4$
V = 230 $I_L = 10$ A

$I_f = (0.7A)$

$I_a = I_L - I_F = 1.4 - 0.7 = 0.7A$

Total input $= VI_L = 230 \times 1.4 = 322A$

$W_c = 321.4$ W

Copper losses $= I_a^2 R_a = 0.7^2 \times 1.25 = 0.61$

$$\eta = \frac{\text{output}}{\text{Input}} = \frac{\text{Input} - \text{losses}}{\text{Input}} = \frac{VI_L - [W_c + I_a^2 R_a]}{VI_L}$$

$$= \frac{322 - 322}{322} = 0\%$$

ROLL NUMBER :

Model Graph :-

Precautions :-

1. Run the motor at rated speed and rated Voltage
2. Avoid loose connections and Parallel errors.

Result :-

Hence Verified the efficiency and constant losses at DC shunt machine by Swinburne's test.