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F-24

EXPERIMENT : No. 07 To Study Energy Meter

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Date

- **Aim**: Calibration of single phase energy phase meter by "Phantom Loading" method.
- **Apparatus**: Autotransformer, Voltmeter (0-300V), Ammeter (0-5A), Rheostat (750Ω, 12A), Wattmeter (300V, 2A), Energy meter, 230V, 50Hz AC supply.
- **Theory**:
  - Phantom landing is a phenomenon in which appliances consume electricity even when they are turned OFF.
  - The disc rotates (of energy meter) which increases reading of meter but the device does not consume power.
  - Phantom loading mainly occurs in electronic appliances. This method is used for examining current rating ability of energy meter.
  - The actual loading consumes very less power as compared to real loading and because of this, it is used for testing energy meter.
- **Procedure**:

1. Connect the circuit as shown in figure.
2. Fix the input voltage to some value by varying auto transformer
3. Rheostat is kept at maximum position initially

Sundaram

Teacher's Sign. : _____

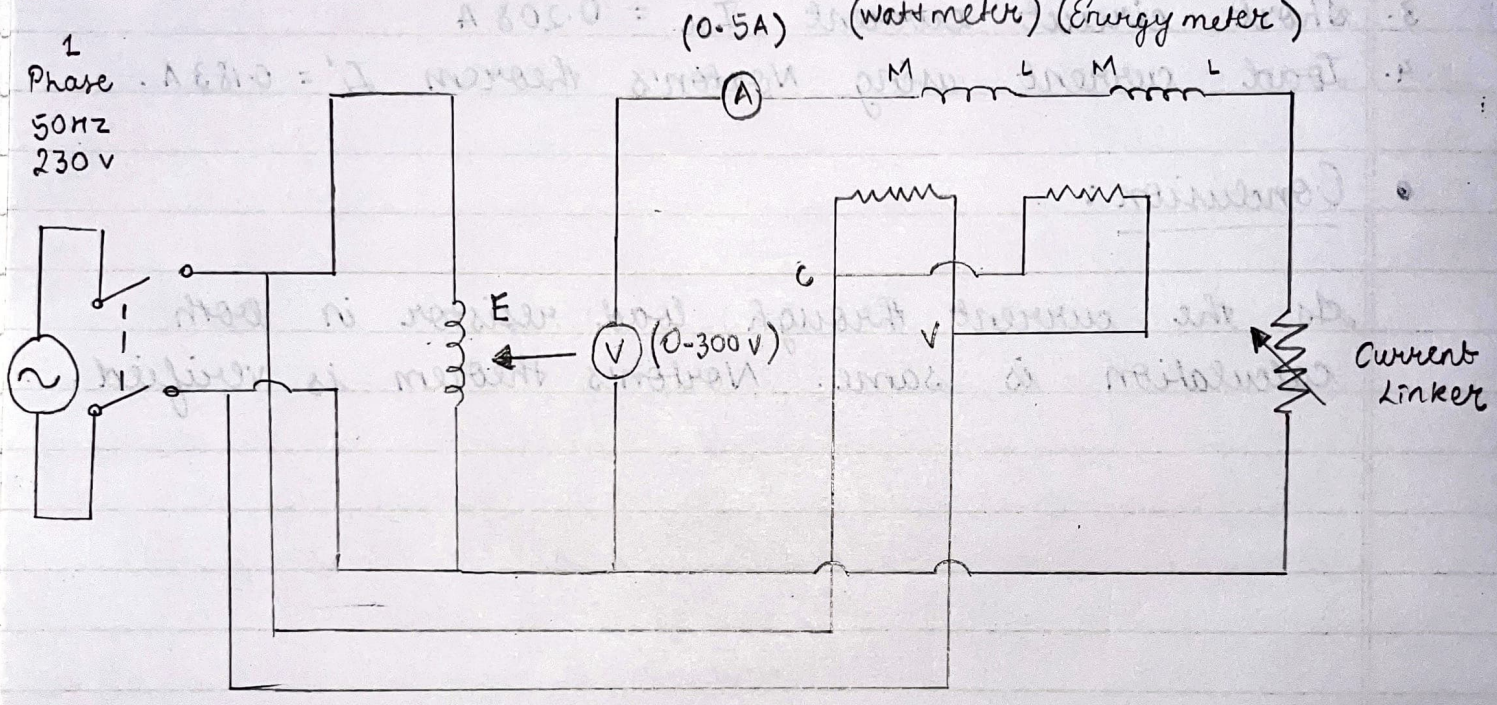
1
Phase
50Hz
230 V
(0-5A)
(watt meter)
(Energy meter)
A
M
L
M
L
C
V
E
V
(0-300 V)
Current
Linker

Fig. 1

and slowly varied to get the different readings of ammeter, voltmeter & wattmeter is measured

4. The time for impulse of the energy meter ~~is~~ disc is measured.
5. The true energy and indicated energy is evaluated & used to find error.

- **Conclusion :**

Energy meter are installed in house to measure the total energy consumed and it can be calibrated by comparing its reading with watt meter reading.

Observation Table

Sr no.	Voltage (V)	Current (A)	Power (W)	Time (S)	No. of Rev	Theo. Energy	Meas. Energy	Error (%)
1	110	0.14	38	137	5	5000	5205	4.12
2	110	0.2	43.2	116	5	5000	5011.2	0.224
3	110	0.22	46	111	5	5000	5106	2.12
4	110	0.25	54.4	90	5	5000	4896	2.08
5	110	0.28	60	78	5	5000	4680	6.4

Calculations :

1. $E_2 = 38 \times 137 = \underline{5206 \text{ J}}$

$$\text{Error} = \left| \frac{E_2 - E_1}{E_1} \right| \times 100 = \left| \frac{206}{5000} \right| \times 100 = \underline{4.12\ \%}$$

2. $E_2 = 43.2 \times 116 = \underline{5011.2 \text{ J}}$

$$\text{Error} = \left| \frac{E_2 - E_1}{E_1} \right| \times 100 = \left| \frac{11.2}{5000} \right| \times 100 = \underline{0.224\ \%}$$

3. $E_2 = 46 \times 111 = \underline{5106 \text{ J}}$

$$\text{Error} = \left| \frac{E_2 - E_1}{E_1} \right| \times 100 = \left| \frac{106}{5000} \right| \times 100 = \underline{2.12\ \%}$$

4. $E_2 = 54.4 \times 90 = \underline{4896 \text{ J}}$

$$\text{Error} = \left| \frac{E_2 - E_1}{E_1} \right| \times 100 = \left| \frac{104}{5000} \right| \times 100 = \underline{2.08\ \%}$$

5. $E_2 = 60 \times 78 = \underline{4680 \text{ J}}$

$$\text{Error} = \left| \frac{E_2 - E_1}{E_1} \right| \times 100 = \left| \frac{320}{5000} \right| \times 1000 = \underline{6.4\ \%}$$