**Round 3**

**Lab Mannual**

**1.Aim**

## To make connection and measurement of power consumption of a fluorescent lamp (tube light).

**2.Theory**

A fluorescent lamp is a sealed glass tube with two electrodes at its two ends. The fluorescent lamp circuit consists of a choke coil, a starter and a fluorescent tube. The length of the commonly used fluorescent tube is 100 cm; its power rating is nearly 40 W, 230V and 50 Hz. The tube is filled with argon and a drop of mercury. When the supply is switched on, the current heats the filaments and initiates emission of electrons. After one or two seconds, the starter circuit opens and makes the choke to induce a momentary high voltage surge across the two filaments. Ionization takes place through argon and produces bright light.

***Starter:*** Special kind of switch that consists of a small gas-discharge tube, containing neon or argon in parallel with a normally open bi-metallic switch. It is connected in parallel with the fluorescent lamp. When a voltage is applied, discharge is generated within the starter tube, heating and bending the bimetallic electrode, causing the switch contacts to close. Consequently, the discharge disappears and within a second, bimetallic strip reverts back to its normal position causing the switch contacts to open.

***Choke Coil:*** Choke Coil is a high-inductance coil which must be used in series with fluorescent lamp for two reasons. During starting time, it generates a high voltage pulse across the tube when the starter's contacts open. That pulse causes the gas in the tube to ionize and provide a low-resistance path between the two electrodes of the lamp. During running time, it limits the lamp current to prevent the lamp from being short circuited.

Circuit diagram shown below is the connection diagram of a fluorescent lamp, starter and choke coil. In this circuit when the 1-phase supply is applied then the measurement of power consumption of fluorescent lamp is done with the help of wattmeter. Finally with the help of wattmeter, ammeter and voltmeter the power factor of circuit is calculated.

**Circuit Diagram**

**3.Procedure**

It contains step by step procedure to run the simulator of virtual lab experiment

1. Click on the simulation button to open the simulator.
2. Switch ON the simulator Enable power button to work on the simulator.
3. Then from the place equipments area select the equipments according to the instruction to make connection in the working canvas area.
4. After placing the all equipment connect devices with wires.
5. Once the circuit connection is completed then switch ON the power supply of the circuit and select the multiplying factor of the wattmeter.
6. Then output power is shown in the output meter window along with voltmeter reading and ammeter reading.
7. Repeat the step 5 for another value of multiplying factor and note down the output reading.
8. Therefore, from this reading user will calculate the power consumed by fluorescent lamp and finally the power factor of the circuit.

**Observation Table**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S. No.** | **Power Supply Switch** | **Wattmeter multiplying factor selector switch** | **Wattmeter Reading**  **(in watts)** | **Voltmeter reading**  **(in volts)** | **Ammeter Reading**  **(in Amp.)** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Calculations**

Total Power Consumed by Fluorescent Lamp= (Wattmeter Reading × Multiplying factor of Wattmeter)

Power Factor= (Total Power Consumed by Fluorescent Lamp)/(Voltmeter reading × Ammeter Reading )

**4.Pre Test**

Q1. How starter and choke coil are connected with the fluorescent lamp in 1-phase circuit?

Q2. Which gas is used in the fluorescent lamp?

Q3. What is the use of starter and choke coil in the fluorescent lamp (tube light) circuit?

Q4. How to calculate the power consumed by fluorescent lamp and their formula?

Q5. What is power factor and how to calculate the power factor of any single-phase circuit?

Q6. What do you mean by multiplying factor of wattmeter?

**5.Post Test**

Q1. How much total power consumed by fluorescent lamp after simulating the circuit?

Q2. Calculate the power factor of the simulated circuit?

Q3. What is the different multiplying factor of wattmeter given in the simulator?

Q4. What is the rating of fluorescent lamp used in simulator if loss is considered as 2 watts?

**6.References**

1. <https://www.jiscollege.ac.in/ee/pdf/basic-electrical-lab-manual.pdf>

2. <https://www.sawaal.com/physics-questions-and-answers/the-purpose-of-choke-in-tube-light-is_13779#:~:text=When%20the%20switch%20is%20ON,the%20high%20voltage%20across%20it.&text=Then%20gas%20inside%20the%20starter,connect%20to%20the%20fixed%20contact>.

3. <https://www.engineersgarage.com/insight/insight-how-tubelight-starter-works/>

4. <https://www.electrical4u.com/fluorescent-lamp-its-working-principle/>

5.<https://www.bharathuniv.ac.in/colleges1/downloads/courseware_ece/notes/BEE%201L1(BEE%20&%20BEC)%20%20LAB%20MANUAL.pdf>