# E206-TINKERING LAB-I REPORT


**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**NATIONAL INSTITUTE OF TECHNOLOGY GOA**

**NAME: GONABOYINA ANAND KUMAR**

**BATCH: A, B4**

**ROLLNO: 24EEE1017**


**DATE:24-08-2025**

# Module 2: Basic Wiring : Series, Parallel, Staircase, and Godown Wiring

## 1.Series Wiring

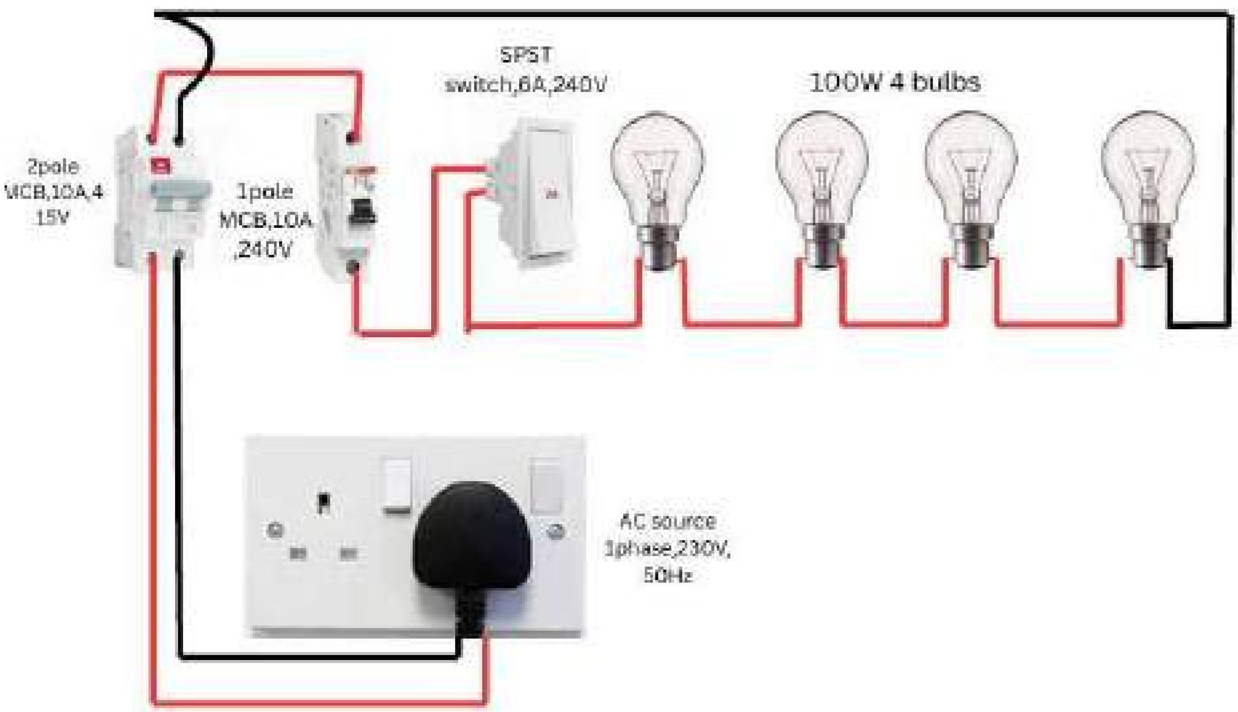
### Aim/Objective:

To study and verify Voltage drop in each Bulb and current in the series wiring.

### Apparatus required:

| Sr no. | Component | Specifications | Make | Quantity |
|---|---|---|---|---|
| 1 | 1-Pole MCB | 240/415V, 50/60Hz | L&T (C10, 6000, EM/EC 60898) | 1 |
| 2 | Connecting wires | - | - | As required |
| 3 | Load- Bulb | 100W, 230V | Philips | 4 |
| 4 | SPST Switch | 6A, 240V | Anchor | 1 |
| 5 | Screw Driver | - | - | 1 |
| 6 | Insulation Tap | - | - | Required incase |
| 7 | Bulb holder | - | Anchor | 4 |
| 8 | 2-Pole MCB | 415V, 50Hz | Legrand (DX3, C10, 1000) | 1 |
| 9 | Plug | 3-Pin | - | 1 |
| 10 | AC tester | - | - | 1 |
| 11 | Wire Stripper | - | - | 1 |
| 12 | AC Supply | 1-Phase, 230, 50Hz | - | - |

## Circuit diagram:




## Theory:

In series wiring, electrical components are connected end-to-end so same current flows through each device one after another. The total resistance of the circuit is the sum of individual resistances If one component fails, the entire circuit becomes as open circuit

This wiring is mainly used for Decorative lightings,  Fuse Protection Circuits,

In Battery Packs Cells are connected in series to increase total voltage, commonly we seen in flashlights, power banks

## Procedure:

Connect the Bulbs in series as per the Series wiring diagram.

Verify  all connections are correctly connected or not and avoid loose contacts or short circuits. Before turning on supply

Use the **Multimeter in Ac Current mode** to measure the current flowing through the circuit.

Use the **Multimeter in Ac voltage mode** to measure the voltage drop across each bulb separately.

Note down the Readings in the tabular form.

Switch OFF the supply after taking the all Readings.

## Equations:

From Ohm's Law: V = IR

Total Resistance (R_total) = R1 + R2 + R3 + ... + Rn  for n components connected in series

Power (P) = V*I  (or)  I^2 * R (or)  V^2 / R

## Observation Table:

| Bulb No. | Voltage Observer | Current Observed | Power observed |
|---|---|---|---|
| B1 | 63.3V | 0.217A | 13.73W |
| B2 | 60.81V | 0.217A | 13.19W |
| B3 | 56.0V | 0.217A | 12.152W |
| B4 | 63.5V | 0.217A | 13.77W |

## Calculations:

Each bulb's dynamic resistance while in Turn on condition:

R=Vobv/Iobv

R1 = 291.7 Ω,

R2 =280.2 Ω,

R3=258.1 Ω ,

R4=292.6 Ω

Total series resistance: R_total=∑Ri=1122.6 Ω

Calculated current at 230 V:

I_calc=230/RΣ=0.2049

Voltage and power across each bulb :

**Voltages (Vi_calc):** $V_1$ = 59.76 V, $V_2$ = 57.41 V, $V_3$ = 52.87 V, $V_4$ = 59.95 V

**Powers (Pi_calc):** $P_1$ = 12.24 W, $P_2$ = 11.76 W, $P_3$ = 10.83 W, $P_4$ = 12.28 W

## Results:

This experiment verified that in series wiring, the same current flows through all loads.

But the total voltage is distributed across the individual components based on their resistance.

## Conclusion:

It was observed that based on its Resistance voltage divides in each component in series wiring and same.current flows across each component connected in series.

## Precautions

→ Do not exceed rated voltage of bulbs to avoid Damage to it.

→ **Avoid** touching live wires or terminals during operation.

→Switch ON supply after verify the connections. Only to avoid short circuit.

→ Keep the workspace **dry**

# 2.Parallel Wiring

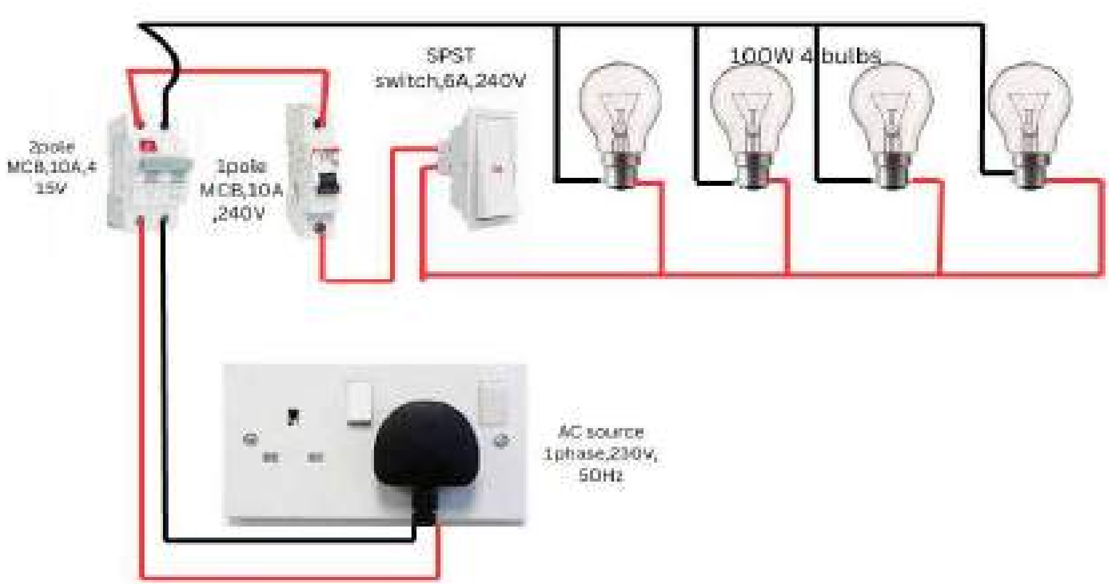
## Aim/Objective:

To study and verify the working of parallel wiring connection.

## Apparatus Required:

| Sr no. | Component | Specifications | Make | Quantity |
|---|---|---|---|---|
| 1 | 1-Pole MCB | 240/415V, 50/60Hz | L&T (C10, 6000, EM/EC 60898) | 1 |
| 2 | Connecting wires | - | - | As required |
| 3 | Load- Bulb | 100W, 230V | Philips | 4 |
| 4 | SPST Switch | 6A, 240V | Anchor | 1 |
| 5 | Screw Driver | - | - | 1 |
| 6 | Insulation Tap | - | - | Required incase |
| 7 | Bulb holder | - | Anchor | 4 |
| 8 | 2-Pole MCB | 415V, 50Hz | Legrand (DX3, C10, 1000) | 1 |
| 9 | Plug | 3-Pin | - | 1 |
| 10 | AC tester | - | - | 1 |
| 11 | Wire Stripper | - | - | 1 |
| 12 | AC Supply | 1-Phase, 230, 50Hz | - | - |

## Circuit diagram:



## Theory:

In parallel wiring, all components are connected across the same supply voltage. Each component operates independently, drawing its own current. Applications include domestic wiring systems where appliances work independently.

## Procedure:

Connect the circuit as per the parallel wiring diagram.

Ensure all connections are correct and switches are OFF initially.

Switch ON the supply using the Variac and adjust gradually.

Measure the current through each branch and total current from the main line.

Record voltage across each lamp and current in tabular form.

Switch OFF the supply after completion.

## Mathematical Equations:

Ohm's Law: $V = IR$

Total Current ($I_{total}$) = $I1 + I2 + I3 + ... + In$

Power (P) = VI

## Observations:

| Bulb No. | Voltage Observer | Current Observed | Power Observed | Resistance Observed |
|---|---|---|---|---|
| B1 | 234.3V | 0.445A | 104.263W | 526.51 Ohm |
| B2 | 234.3V | 0.445A | 104.263W | 526.51 Ohm |
| B3 | 234.3V | 0.445A | 104.263W | 526.51 Ohm |
| B4 | 234.3V | 0.445A | 104.263W | 526.51 Ohm |

## Calculations:

rated hot resistance of a 100 W, 230 V lamp:

Rrated=P/V^2=100/(230)^2=529 Ω

At measured supply V=234.3V:

Icalc=V/Rrated=234.3/529=0.4429

Pcalc=VI=234.3×0.4429=103.77 W

## Results:

The experiment verified that in parallel wiring, each lamp received full supply voltage and worked independently. Total current was equal to the sum of branch currents.

## Conclusion:

Parallel wiring was successfully tested. Voltage remained constant across all loads while current divided among them.

## Precautions:

- Ensure connections are tight and correct.

- Do not exceed rated capacity of supply.

- Switch OFF supply immediately after experiment.

- Handle electrical equipment with care.

# 3.Staircase Wiring

## Aim/Objective:

To study and implement staircase wiring for controlling a lamp from two different locations.

## Apparatus Required:

| Sr no. | Component | Specifications | Make | Quantity |
|---|---|---|---|---|
| 1 | 1-Pole MCB | 240/415V, 50/60Hz | L&T (C10, 6000, EM/EC 60898) | 1 |
| 2 | Connecting wires | - | - | As required |
| 3 | Load- Bulb | 100W, 230V | Philips | 1 |
| 4 | SPDT Switch | 6A, 240V | Anchor | 2 |
| 5 | Screw Driver | - | - | 1 |
| 6 | Insulation Tap | - | - | Required incase |
| 7 | Bulb holder | - | Anchor | 1 |
| 8 | 2-Pole MCB | 415V, 50Hz | Legrand (DX3, C10, 1000) | 1 |
| 9 | Plug | 3-Pin | - | 1 |
| 10 | AC tester | - | - | 1 |
| 11 | Wire Stripper | - | - | 1 |
| 12 | AC Supply | 1-Phase, 230V, 50Hz | - | - |

## Circuit diagram:

## Theory:

Staircase wiring is used to control a lamp from two different locations using two 2-way switches. This type of wiring is commonly used in staircases, long corridors, and halls.

## Procedure:

Connect the circuit using two 2-way switches and one lamp as per the wiring diagram.

Ensure the supply is OFF while making connections.

Switch ON the supply and operate the switches alternately to control the lamp.

Verify that the lamp can be switched ON/OFF from both locations independently.

Switch OFF the supply after completion.

## Mathematical Equations :

Power (P) = VI

## Observations:

| Parameter | Theoretical value | Practical value |
|---|---|---|
| Voltage | 230V | 230.32V |
| Current | 434.75mA | 434.75mA |

## Calculations:

Rated lamp numbers at 230 V:

Icalc=V/P=230/100=0.43478 A

Rhot=VI=230x0.43478=529

Using  practical voltage 230.32 V with the same resistance:

Icalc=230.32/529=0.4353 A

## Results:

The experiment verified that the lamp could be controlled from two different locations using two 2-way switches.

## Conclusion:

Staircase wiring was successfully tested and the lamp could be operated from both switch positions.

## Precautions:

- Ensure proper wiring connections with 2-way switches.

- Do not exceed rated capacity of switches.

- Check wiring before switching ON supply.

- Handle electrical equipment safely.

# 4: Godown Wiring

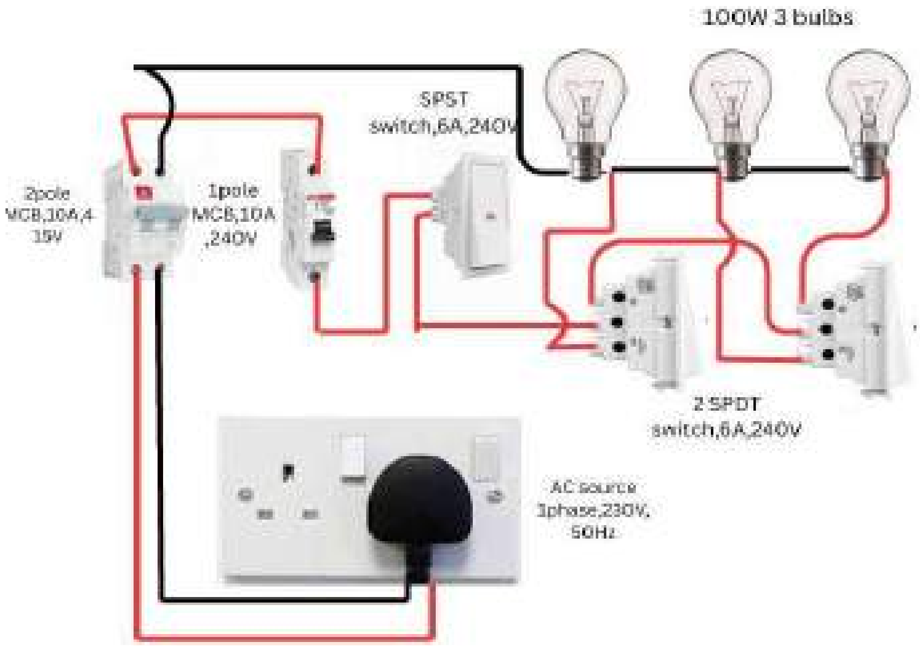
## Aim/Objective:

To study and implement godown wiring for controlling multiple lamps in a sequence.

## Apparatus Required:

| Sr no. | Component | Specifications | Make | Quantity |
|---|---|---|---|---|
| 1 | 1-Pole MCB | 240/415V, 50/60Hz | L&T (C10, 6000, EM/EC 60898) | 1 |
| 2 | Connecting wires | - | - | As required |
| 3 | Load- Bulb | 100W, 230V | Philips | 3 |
| 4 | SPDT Switch | 6A, 240V | Anchor | 2 |
| 5 | SPST Switch | 6A, 240V | Anchor | 1 |
| 6 | Screw Driver | - | - | 1 |
| 7 | Insulation Tap | - | - | Required incase |
| 8 | Bulb holder | - | Anchor | 1 |
| 9 | 2-Pole MCB | 415V, 50Hz | Legrand (DX3, C10, 1000) | 1 |
| 10 | Plug | 3-Pin | - | 1 |
| 11 | AC tester | - | - | 1 |
| 12 | Wire Stripper | - | - | 1 |
| 13 | AC Supply | 1-Phase, 230V, 50Hz | - | - |

# Circuit diagram:




## Theory:

Godown wiring is used to control multiple lamps in such a way that only one lamp glows at a time while others remain OFF. This is used in godowns, warehouses, and passages where sequential lighting is required.

## Procedure:

Connect the circuit using three lamps and switches as per the godown wiring diagram.

Ensure the supply is OFF while making connections.

Switch ON the supply and operate the switches one by one.

Verify that only one lamp glows at a time while others remain OFF.

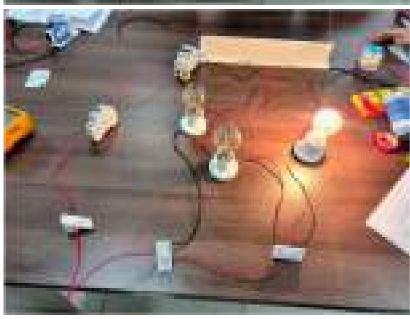
Switch OFF the supply after completion.

Mathematical Equations and Calculations

No specific equations; logic of sequential switching applies.

Power (P) = VI





## Results:

The experiment verified that in godown wiring, only one lamp glows at a time depending on switch operation.

## Conclusion:

Godown wiring was successfully tested and sequential lighting was achieved.

## Precautions:

- Ensure connections are made as per the diagram.

- Do not exceed rated capacity of lamps.

- Check circuit before switching ON supply.

- Switch OFF supply after completion.