Journal of Image Processing and Intelligent Remote Sensing
ISSN 2815-0953
Vol: 02, No. 02, Feb-Mar 2022
http://journal.hmjournals.com/index.php/JIPIRS
DOI: https://doi.org/10.55529/jipirs.22.24.31

Superior Short Circuit & Overcurrent Protection of Devices Like Alternator, Transformer Etc.

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Received: 02 December 2021 **Accepted:** 19 February 2022 **Published:** 14 March 2022

***Abstract:** Improved motor, controller and branch circuit protection has been the subject of a never-ending stream of magazine articles, IEEE papers and amendments to the National Electrical Code. Combining motor short-circuit protectors and properly certified motor controllers may provide superior branch circuit overcurrent protection. An Alternator, Transformer, and Other Devices with Superior Short Circuit and Overcurrent Protection are discussed in this study.*

***Keywords:** Short-Circuit Protectors, Overcurrent Alternator, Transformer.*

1. INTRODUCTION

When the phasor difference between two or more electrical values reaches a predefined amount, a differential relay is activated. Protective relaying with differential selection and action is the most effective. Phase angle and magnitudes of two or more electrical values are compared to see whether they are comparable. Comparing two electrical values in a circuit using differential relays is an easy and effective method. Generators, transformers, bus bars, transmission lines, and other components make up the contemporary electric power system. Protection against a range of fault circumstances, which may occur sooner or later, is both desired and required. It is convenient for us to focus on protecting alternators, transformers and bus bars as well as protecting against excessive voltages. Alternator stator winding defects are the most critical and need quick care. Short circuits in the transformer or in the connections to the transformer are the most common causes of transformer failures. To defend against these failures, a differential relay scheme is utilized since the differential nature of measurements makes this system more sensitive than conventional protection methods. The differential protection relay is a kind of relay whose functioning is dependent on the phase difference between two or more electrical values. An electrical quantity's phase angle and magnitude are compared to determine its phase angle. For instance: Consider the comparison of the transmission line's input and output currents. If the transmission line's input current is greater

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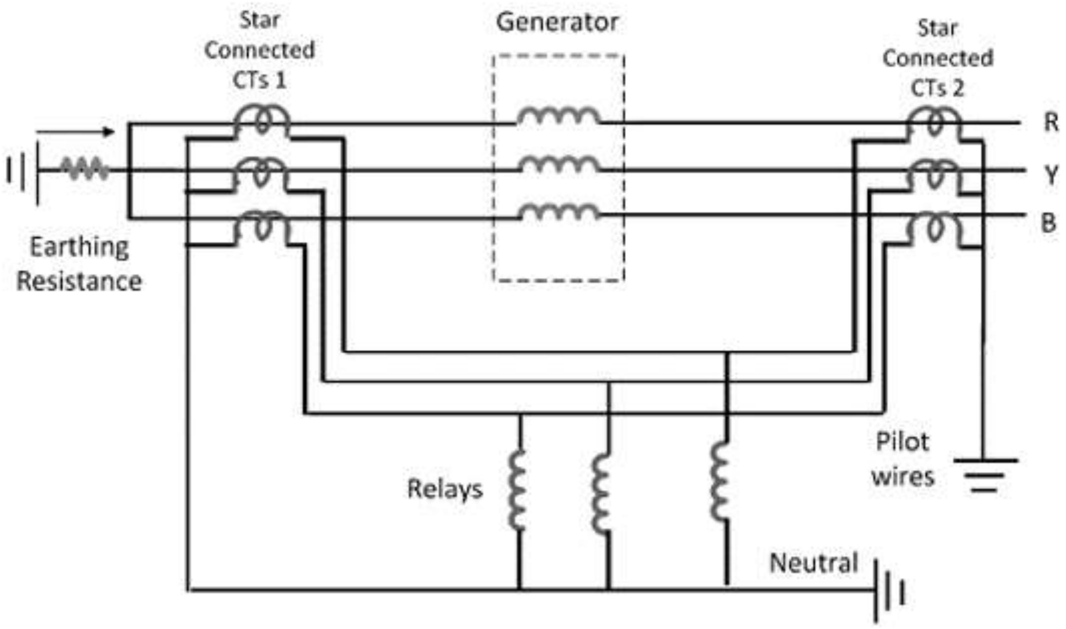
than its output current, then extra current is flowing through it as a result of the defect. The differential protection relay may be operated by the current difference.

2. METHODOLOGY

The insulation failure is to blame for the failure in the R phase of the network, which is where the problem arises. The secondary current of the transformer is not equal because of the defect. The relay coil receives the differential currents. As a result, the relay is activated and sends a signal to the circuit breaker, which then activates. Y and B are examples of two phases via which short-circuit current flows if a defect is found between the two. The CTs' current flow was imbalanced by the fault. The relay contacts are tripped by the difference in current flow through the operational coil of the relay.



Merz-Price Protection With Relay Being Connected in the Midpoints of Two Sets of CTs.

The term "current differential relay" refers to a relay that detects and operates the phase difference between the current entering and exiting the electrical system. Overcurrent relays are depicted in the image below coupled in a differential design.

The overcurrent relay is represented in the diagram below. The protected area is shown by the dotted line. Both the protective zone's ends have a current transformer. The pilot wire is used to link the transformers' secondary windings together. As a result, the CTs are induced to flow in the same direction as the current. Secondary of the CTs serves as the operational coil of the relay, which is linked to it.

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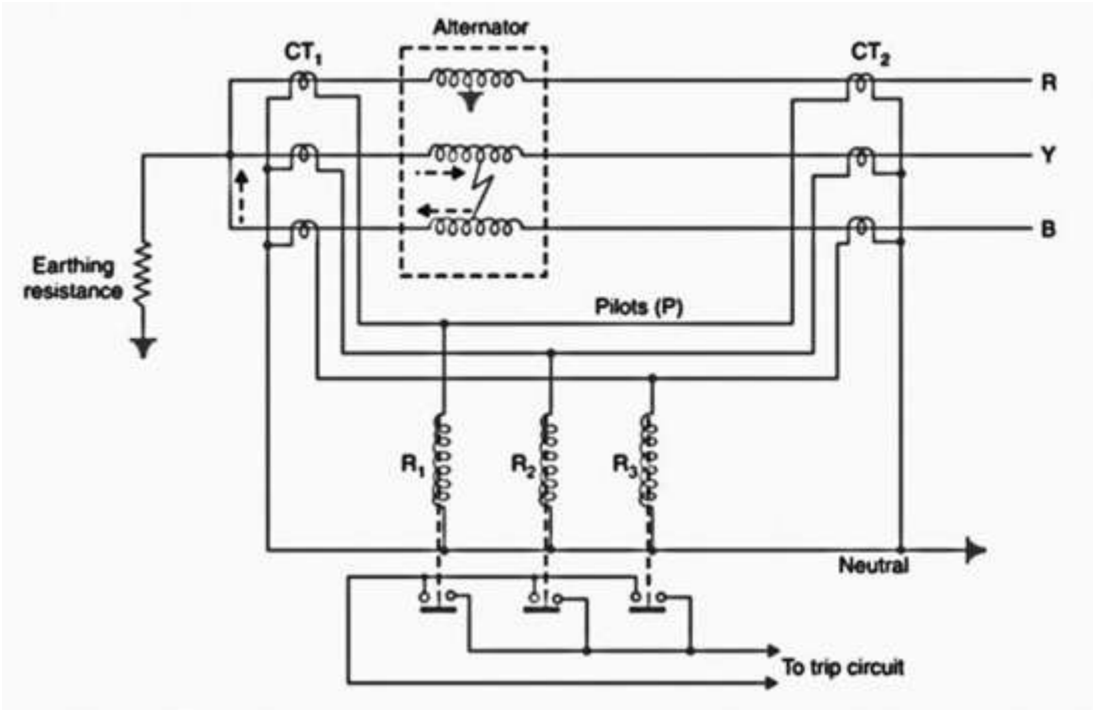

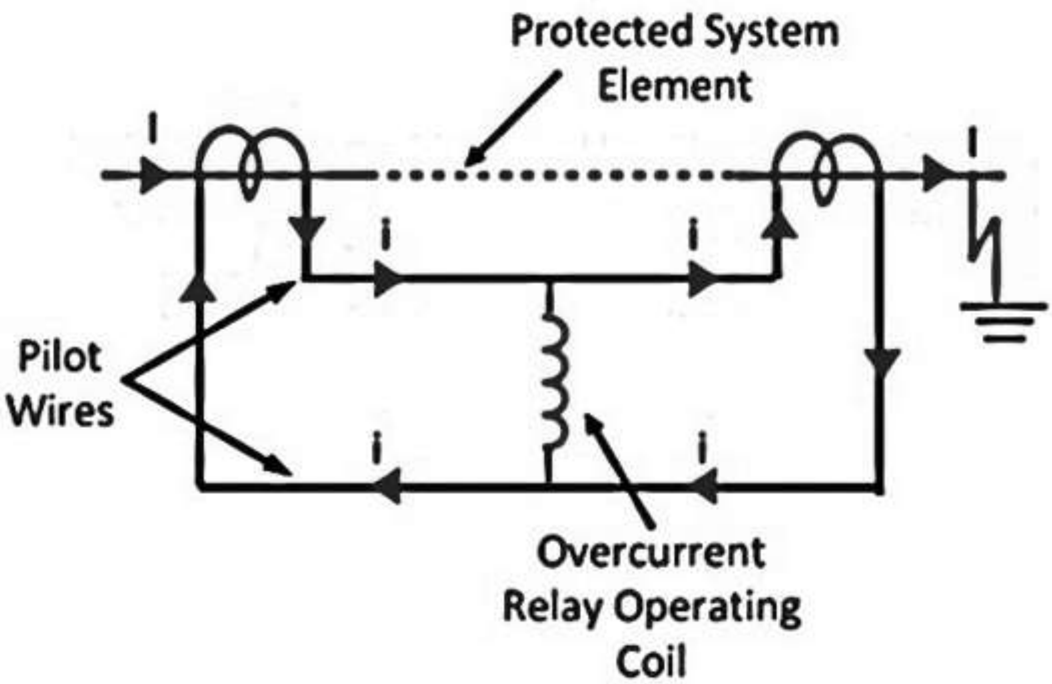

For an External Load or Fault

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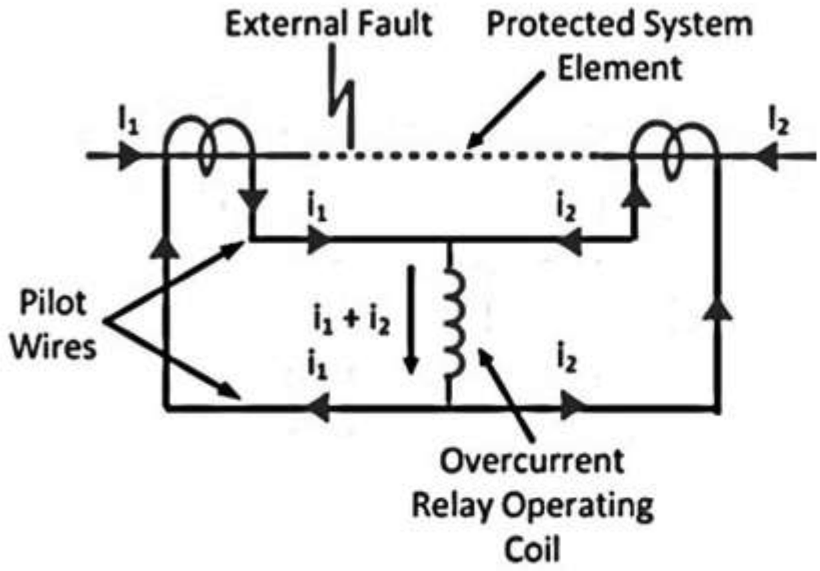
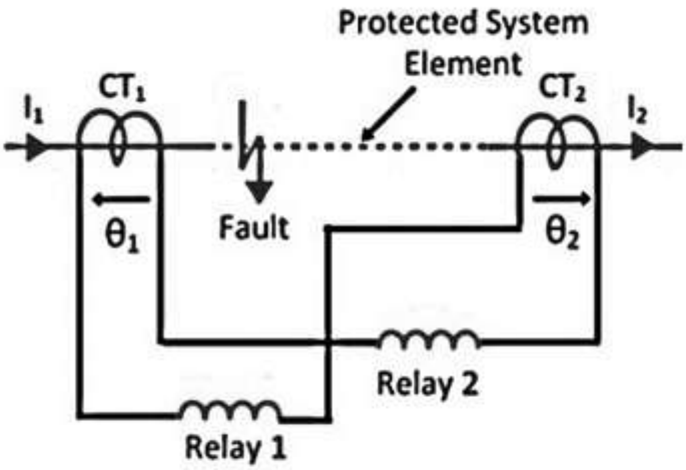


For an Internal Fault



Balance Voltage Differential Protection

In normal operation, the secondary current of the CTs does not change in amplitude. The operational coil has no current flowing through it. As soon as there is a defect, there is an imbalance in the secondary current of CTs and the relay activates. Feeder protection cannot be achieved using a current differential relay. Voltage balancing differential relays are used to safeguard the feeders. The voltage differential relay employs a pilot wire and two identical current transformers to arrange themselves across the protection zone. The secondary of the

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current transformer is linked in series with the relays. In normal operation, the relays are linked in such a manner that no current passes through them. Using air core CTs, a voltage balancing differential relay balances voltages and currents.

Current imbalance causes voltage in the secondary of CTs to fluctuate, which is why the CTs' protection zone current is unbalanced when a fault occurs there. The working coil begins to draw electricity. As a result, the circuit breaker is activated and the relay begins to work.

Working Procedure

Using MATLAB Simulink software-

1. Power on a computer
2. Install MATLAB software (if not Yet)
3. Run MATLAB software
4. Open Simulink form MATLAB
5. Find the all component from Library
6. Connect component each other as like Circuit Diagram
7. Simulate this Diagram
8. Collect results from Scopes and
9. Analysis those output figures

Circuit Diagram

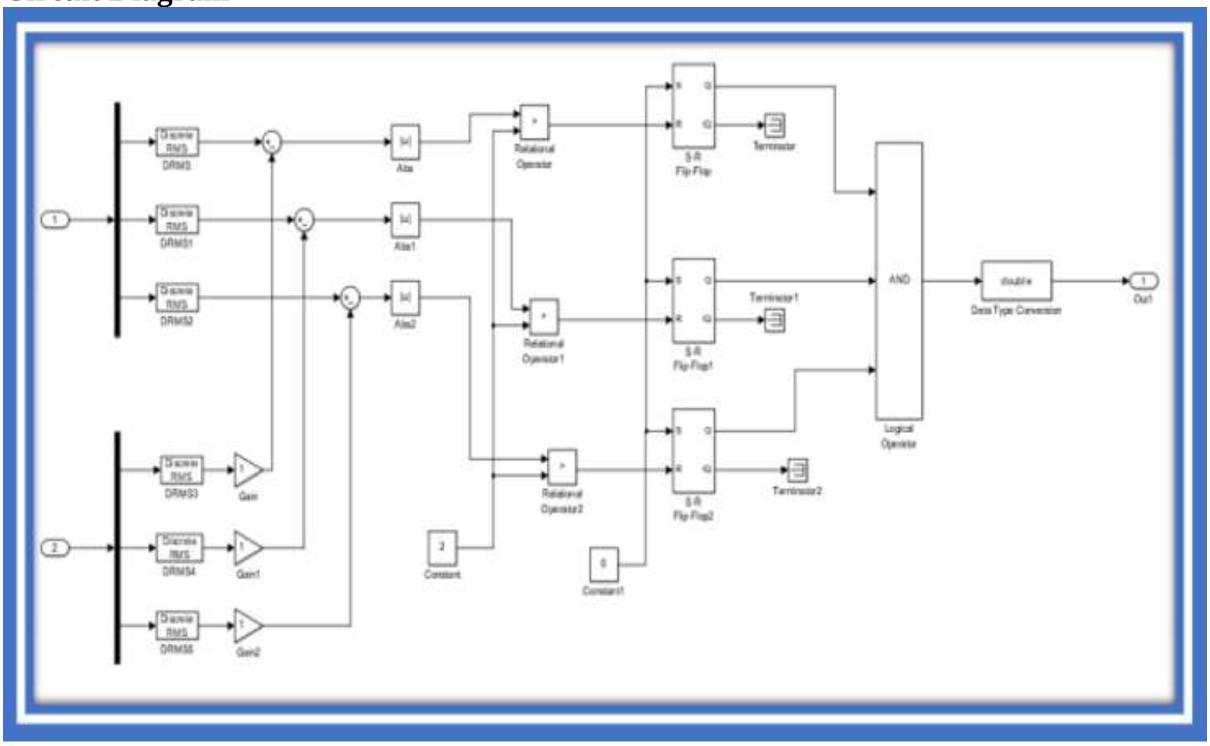

Fig 6: MATLAB Simulink Block Diagram For differential current relay

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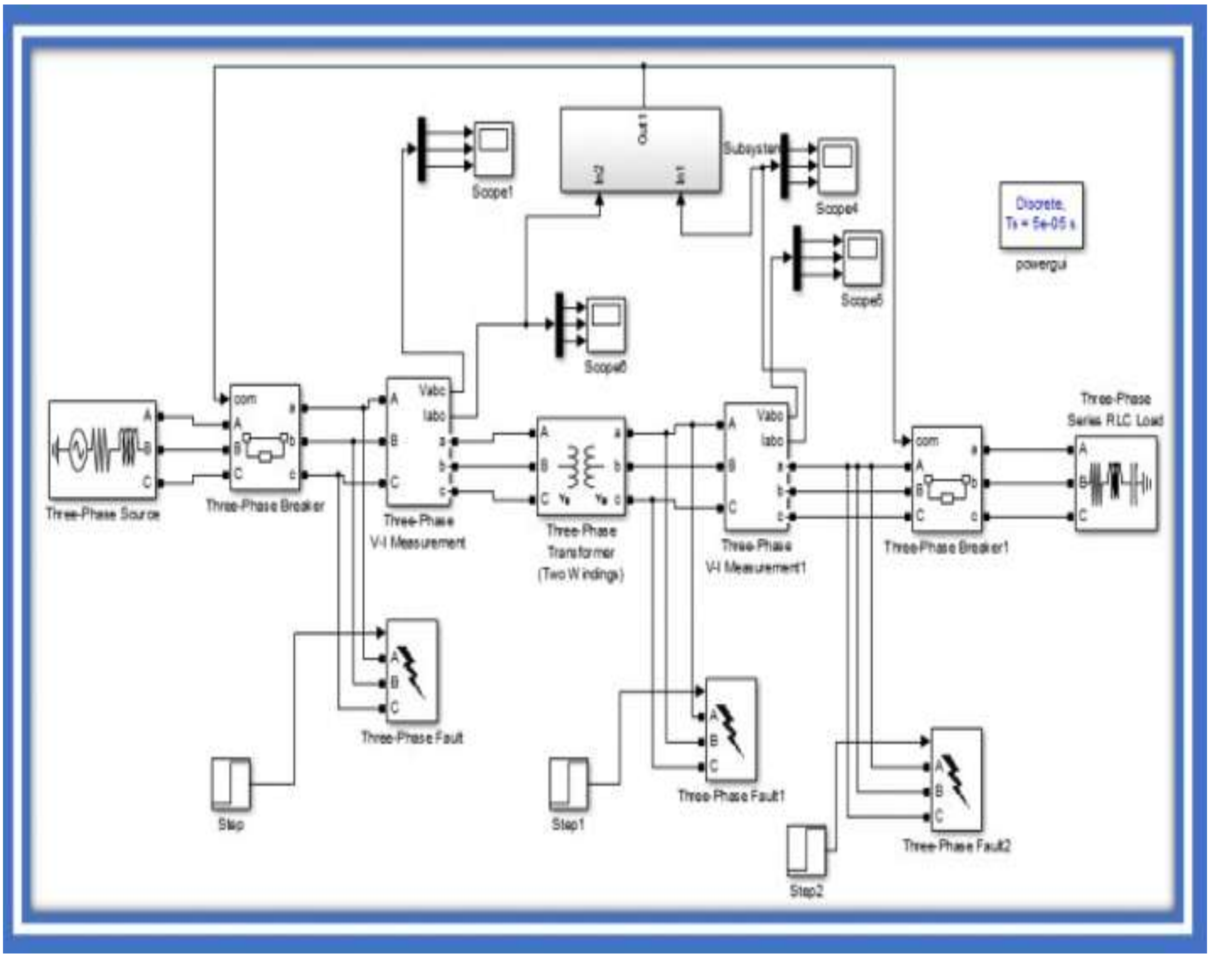

Fig 7: Internal Circuit diagram of Subsystem

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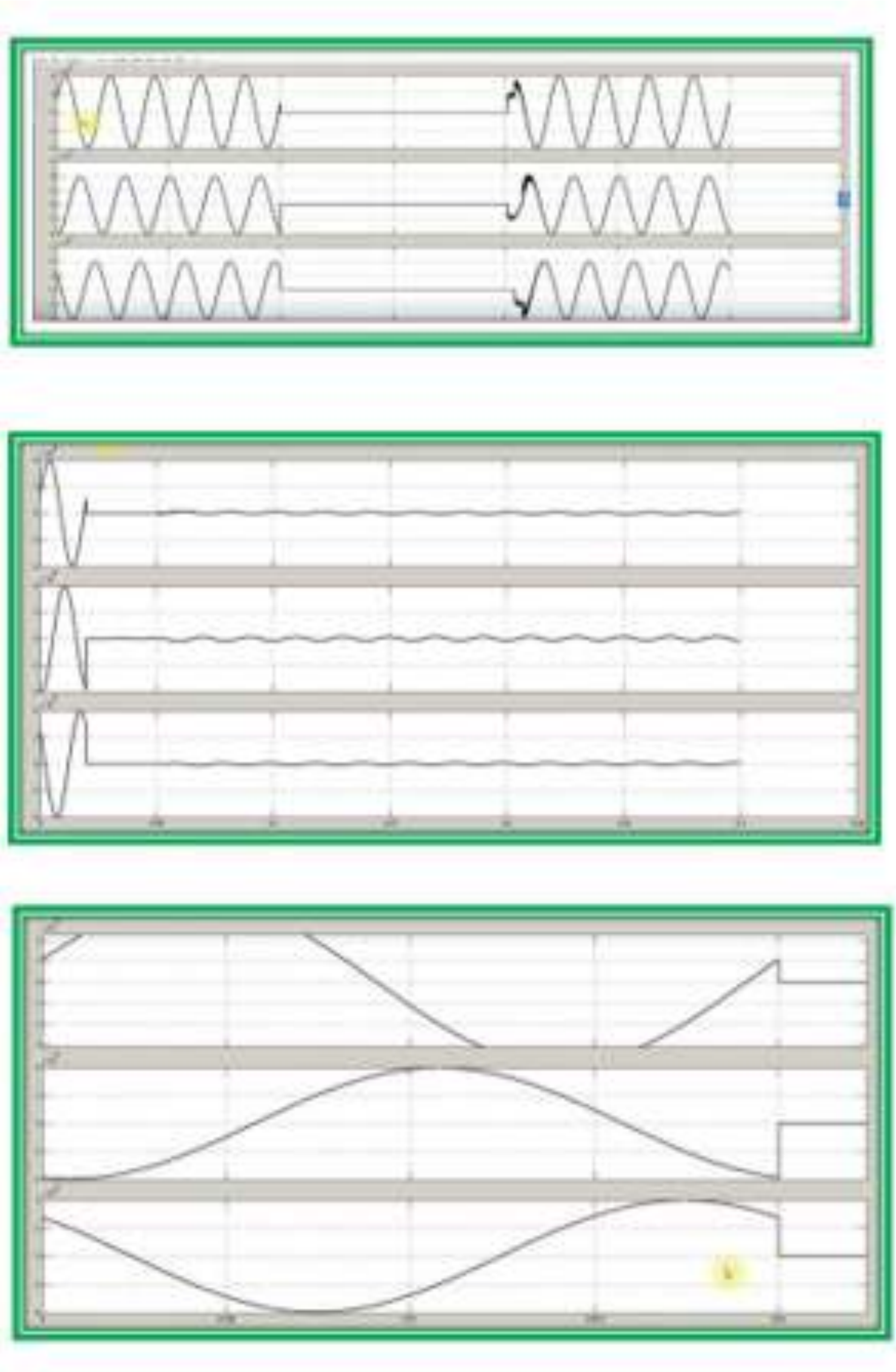

Fig.8 Output Result

3. CONCLUSIONS

Electrical power installations are controlled and protected by Overcurrent Protective Devices (OPDs) in this study. Protecting the motors, wires, and transformers against overloading and short-circuit currents are circuit breakers that meet the enhanced criteria. There is no dust, caustic vapours, or hostile gases present in confined rooms where they may be used. They are climatically stable. Steel casing must be used in this case.

Acknowledgment
We would like to acknowledge us deepest gratitude to our honorable course teacher, Mr. Sarwar Ahmed, Lecturer, Department of Electrical and Electronic Engineering, Bangladesh University of Business and Technology (BUBT). He gave us his precious time from the very beginning of this report till the completion. His expert guidance, affectionate encouragement provides us critical insight into the research problem and shows us the way for the meaningful ending of the report work in short duration.

4. REFERENCES

1. Rojnić, Michele, et al. "A Comprehensive Assessment of Fundamental Overcurrent Relay Operation Optimization Function and Its Constraints." Energies 15.4 (2022): 1271.
2. Xing, Diang, et al. "1200-V SiC MOSFET Short-Circuit Ruggedness Evaluation and Methods to Improve Withstand Time." IEEE Journal of Emerging and Selected Topics in Power Electronics (2022).
3. Chen, Xiao Yuan, et al. "Superconducting fault current limiter (SFCL) for a power electronic circuit: experiment and numerical modelling." Superconductor Science and Technology (2022).
4. Konstantatos, Konstantinos. "Feasibility study on the retrofit of conventional ferry covering the distance Argostoli-Lixouri into battery-powered one." (2022).
5. A Salah, Ahmed Salah, et al. "Improving ESP Performance in Low Productivity Gassy Wells: Case Study." International Petroleum Technology Conference. OnePetro, 2022.
6. Lemley, Mark A., and Mark P. McKenna. "Trademark Spaces and Trademark Law's Secret Step Zero." Available at SSRN 4020571 (2022).
7. Cock, David, et al. "Enzian: an open, general, CPU/FPGA platform for systems software research." Proceedings of the 27th ACM International Conference on Architectural Support for Programming Languages and Operating Systems. 2022.
8. Rossi, Mattia, Petros Karamanakos, and Francesco Castelli-Dezza. "An Indirect Model Predictive Control Method for Grid-Connected Three-Level Neutral Point Clamped Converters with LCL Filters." IEEE Transactions on Industry Applications (2022).
9. Ahammed, Md Tabil, et al. "Design of Porous Core Fiber for Terahertz Regime using Zeonex." 2021 4th International Conference on Computing and Communications Technologies (ICCCT). IEEE, 2021.

