



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.



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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai.

DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 19AUB204 – AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERING

II YEAR / IV SEMESTER

Unit 3 – Charging System

Topic : Voltage and Current Regulator



VOLTAGE REGULATOR



- ❖ Voltage regulation ensures that the output voltage remains stable within a specified range despite variations in input voltage, load conditions, or other factors.
- ❖ In a voltage regulator, a feedback mechanism continuously monitors the output voltage and adjusts the regulator's operation to maintain it at the desired level.
- ❖ This adjustment is typically achieved by controlling the voltage across a series or shunt element, such as a transistor or an operational amplifier, to compensate for changes in the input or load.



COMPONENTS



- ❖ **Reference Voltage Source:** The reference voltage source sets the desired output voltage level for the regulator. It could be a fixed voltage reference or a variable reference voltage depending on the type of regulator. Common reference voltage sources include zener diodes, bandgap voltage references, or precision voltage references.
- ❖ **Error Amplifier:** The error amplifier compares the output voltage of the regulator with the reference voltage and generates an error signal proportional to any difference between the two. This error signal is used to adjust the regulator's operation to maintain the output voltage at the desired level.



COMPONENTS



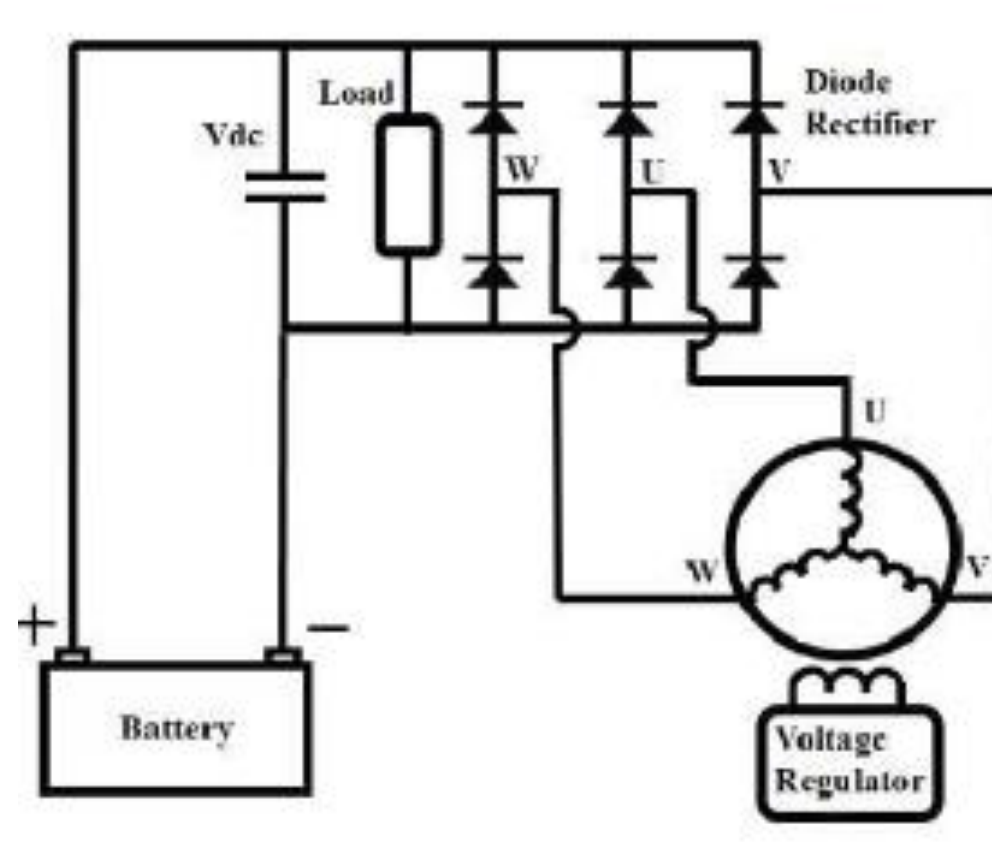
- ❖ **Feedback Network:** The feedback network provides a path for the output voltage to be fed back to the error amplifier. This allows the error amplifier to compare the actual output voltage with the reference voltage and generate the appropriate control signal.
- ❖ **Control Element:** The control element, often a transistor or a series of transistors, is responsible for adjusting the output voltage of the regulator based on the error signal generated by the error amplifier. The control element modulates the flow of current to the load or adjusts the voltage across a series or shunt element to regulate the output voltage.



COMPONENTS



- ❖ **Output Capacitor:** An output capacitor is often included to filter out any residual ripple or noise present in the output voltage, ensuring a clean and stable output signal.





CURRENT REGULATOR



- ❖ Current regulation controls the output current of a power supply or charging system to ensure it does not exceed a predetermined limit.
- ❖ In some cases, current regulation may be used in conjunction with voltage regulation to provide both voltage and current limiting capabilities.
- ❖ Current regulation is especially important in applications where overcurrent conditions could damage components or cause safety hazards.
- ❖ The regulator monitors the output current and adjusts its operation to limit the current flow to the specified level, often by controlling the voltage across a series element or by adjusting the duty cycle of a switching regulator.



COMPONENTS



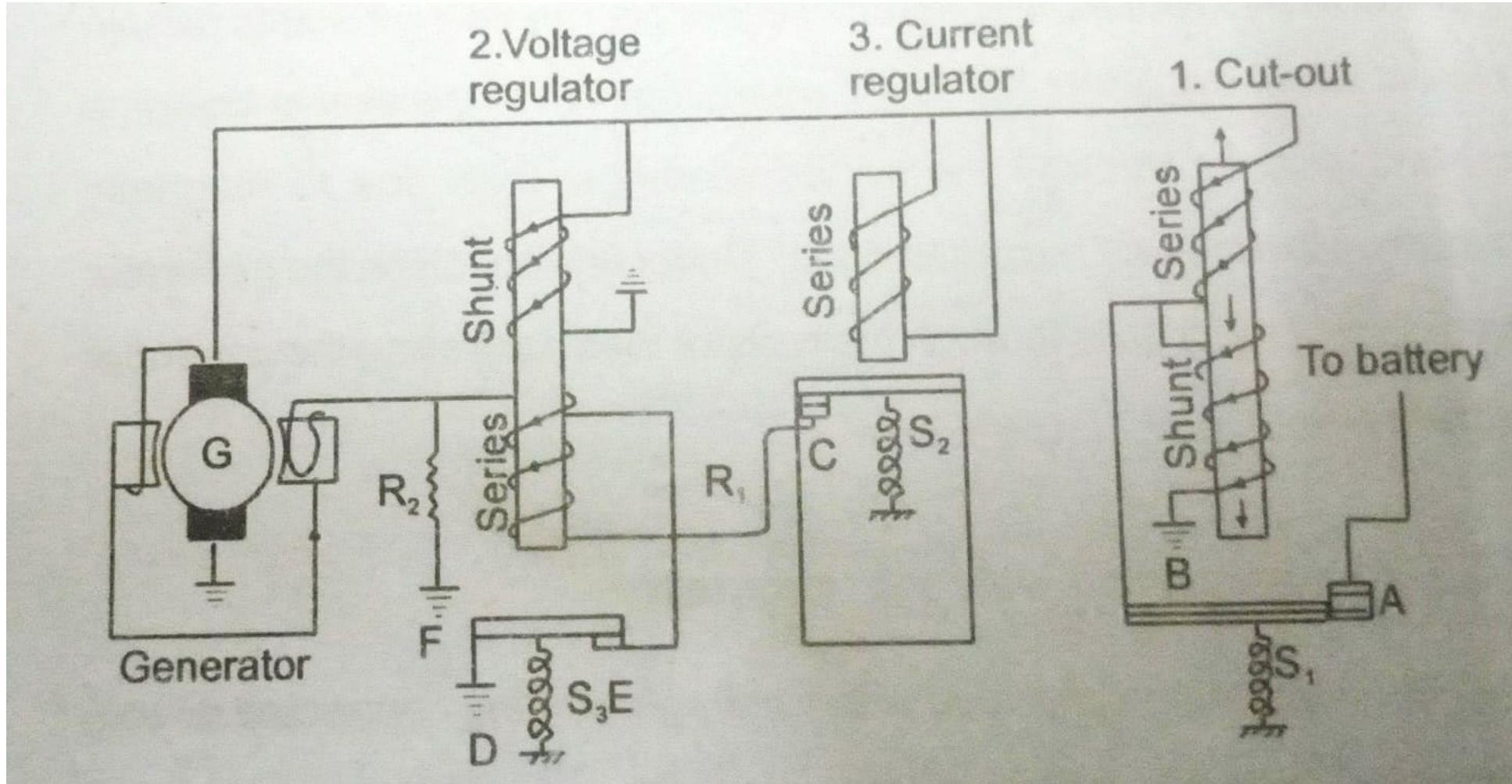
- ❖ **Current Sensing Element:** The current sensing element monitors the output current of the regulator. It could be a resistor placed in series with the load, a current-sensing transformer, or a Hall-effect sensor. The sensing element provides feedback to the regulator circuitry about the actual output current.
- ❖ **Error Amplifier:** Similar to voltage regulators, current regulators often incorporate an error amplifier. The error amplifier compares the sensed output current with a reference current level and generates an error signal proportional to any difference between the two.



COMPONENTS



- ❖ **Feedback Network:** The feedback network provides a path for the sensed current to be fed back to the error amplifier. This allows the error amplifier to compare the actual output current with the reference current and generate the appropriate control signal.
- ❖ **Control Element:** The control element is responsible for adjusting the output current of the regulator based on the error signal generated by the error amplifier. This control element can vary depending on the type of current regulator. It could be a transistor, a series of transistors, or a switching element that modulates the flow of current to the load.





THANK YOU !!!