Semester: Project Report

Tittle: **DC POWER SUPPLY**

Electronic Devices & Circuits

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Summary

This project focused on designing and constructing a 12V DC power supply to convert 24V AC from a centre-tapped transformer into a stable 12V DC output. Key components included an LM 7812 voltage regulator, various capacitors for smoothing and filtering, a bridge rectifier, and a 24V centre-tapped transformer. The circuit design involved stepping down AC voltage with the transformer, converting it to pulsating DC with the bridge rectifier, smoothing it with capacitors, and regulating it with the LM 7812. Components were mounted on a Vero board, and the power supply was tested by connecting it to AC mains, measuring the output voltage, and adjusting it with a potentiometer. Load tests confirmed stable performance. The project successfully created a reliable 12V DC power supply suitable for various electronic applications, with the final product delivering consistent 12V DC output under varying loads. The inclusion of the digital voltmeter ensures easy monitoring of the output voltage, and the potentiometer allows for precise adjustments. The heatsink effectively dissipates heat, ensuring the reliable operation of the voltage regulator.

1. Introduction:

This report details the design and construction of a 12V DC power supply. The objective of this project is to convert 24V AC from a centre-tapped transformer to a stable 12V DC output using a combination of rectification, filtering, and regulation stages. This power supply can be used for various electronic applications requiring a reliable 12V DC source.

2. Components and Specifications:

Voltage Regulator ABI LM 7812:

- A linear voltage regulator that provides a stable 12V DC output.
- Input voltage range: 14.5V to 27V.
- Maximum output current: 1.5A.

Capacitor

- **2200 µF, 63V:**
- **22 µF, 50V:**
- **2.2 µF, 50V:**

Bridge Rectifier:

- Converts AC voltage from the transformer to pulsating DC voltage.
- Typically rated for higher than 24V and adequate current capacity for the load.

24V Centre-Tapped Transformer:

- Steps down mains voltage to 24V AC, centre-tapped to provide two 12V AC outputs.
- Secondary voltage: 2 x 12V AC.

DC Output Terminals:

- Provides connection points for the 12V DC output.

Heatsink:

- Attached to the LM 7812 regulator to dissipate heat generated during operation.

Vero Board:

- A prototyping board used to assemble and connect components.

10k Potentiometer:

- Used for fine-tuning the output voltage.

1k Limiting Resistor:

- Works with the potentiometer to adjust the voltage.

Digital DC Voltage Meter (25V range):

- Used to monitor the output voltage, ensuring it remains within the desired range.

3. Circuit Design:

- The power supply circuit consists of the following stages:

Transformer Stage:

- The 24V centre-tapped transformer steps down the AC mains voltage. The centre tap is grounded, providing two 12V AC outputs.

Rectification Stage:

- The bridge rectifier converts the 24V AC from the transformer into pulsating DC voltage.

Filtering Stage:

- The 2200 µF capacitor smooths the pulsating DC, reducing ripple.
- The 22 µF and 2.2 µF capacitors further filter out high-frequency noise and residual ripple.

Regulation Stage:

- The LM 7812 voltage regulator maintains a constant 12V DC output. A heatsink is used to dissipate excess heat.

Output Stage:

- The regulated 12V DC is available at the DC output terminals.
- The 10k potentiometer and 1k resistor are included for fine-tuning the output voltage if needed.
- The digital DC voltage meter is connected for continuous monitoring of the output voltage.

4. Assembly and Testing:

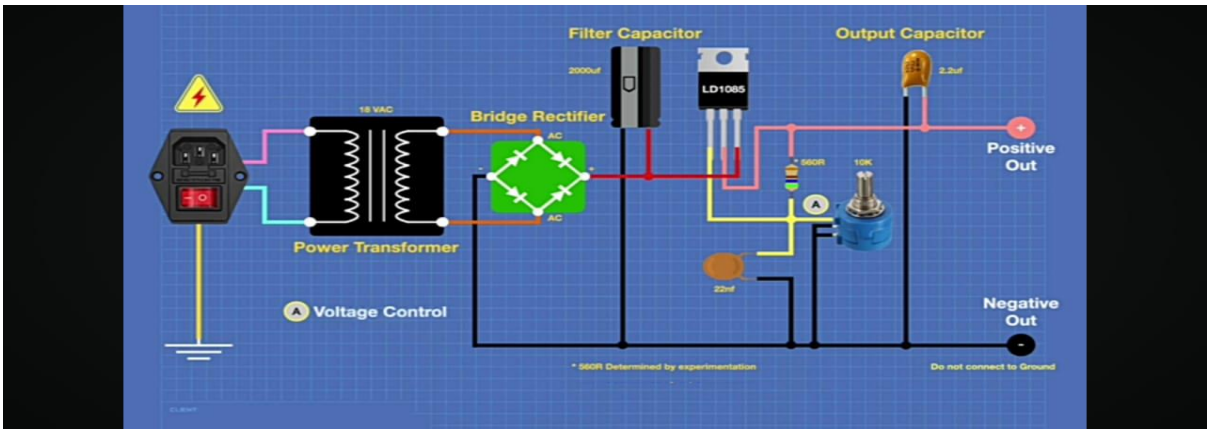
Assembly:

- Components are mounted on the Vero board, following the schematic diagram.
- The transformer's primary winding is connected to the mains supply, and the secondary winding is connected to the bridge rectifier.
- The rectified output is filtered using the capacitors and fed into the voltage regulator.
- The regulated output is connected to the DC output terminals.
- The potentiometer and limiting resistor are connected to adjust the output voltage, and the digital voltmeter is connected for monitoring.

Testing:

- After assembly, the power supply is connected to the AC mains supply.
- The output voltage is measured using the digital DC voltage meter.
- The potentiometer is adjusted to verify the ability to fine-tune the output voltage.
- Load tests are performed to ensure the power supply can deliver the required current without significant voltage drop.

5. Detailed Circuit Diagram:



6. Results:

- The power supply successfully converted 24V AC to a stable 12V DC.
- The output voltage remained consistent at 12V under varying loads.
- The heat generated by the voltage regulator was effectively dissipated by the heatsink.
- The digital voltage meter provided accurate monitoring of the output voltage.
- The potentiometer allowed fine-tuning of the output voltage within a small range.

7. Final Remarks:

In conclusion, the project successfully achieved its objective of creating a stable and reliable 12V DC power supply. The careful selection of components, combined with meticulous assembly and thorough testing, ensured a high-performance output. This power supply can now be confidently used in a range of electronic applications, providing a dependable 12V DC source. Future enhancements could include adding over-voltage and over-current protection circuits to further safeguard connected devices and improve overall safety.

Conclusion:

In this project we have made a 12v DC power supply which provides stable outputs and coverts 24v AC into 12v DC output. Here we have used many components like voltage, capacitor, bridge rectifier ,24v centre-tapped transformer etc. Then we design the circuit where we use bridge rectifier to converts 24v AC and 2200 µF to smooth the pulsating DC and the LM 7812 maintains a constant 12v DC output and many more components. furthermore, will assemble the circuit on the Vero board and will connect the components to ensure whether the power supply can deliver the required current. Finally, the power supply successfully converts the 24v into stable 12v.

8. References:

Voltage regulator datasheet:
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capacitor datasheet:
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