Battery Eliminator Using Zener Diode - Calculations

1. Transformer Output:

- Input: 230V AC
- Output (RMS): 9V
- Peak Voltage: 9 x 1.414 = 12.7V

2. After Bridge Rectifier:

- Diode drop: 1.4V (0.7V x 2)
- DC Voltage: 12.7V - 1.4V = 11.3V

3. Zener Regulation:

- Zener Voltage: 5V
- Resistor: 1k ohm
- Voltage across R: 11.3V - 5V = 6.3V
- Current: 6.3V / 1k ohm = 6.3mA

4. Ripple Voltage:

- I = 6.3mA, C = 100uF, f = 100Hz
- Vr = I / (f × C) = 0.63V

5. Power Dissipation:

- Resistor: P = I^2 × R = 0.04W
- Zener: P = V × I = 5V × 6.3mA = 0.0315W

Output voltage observed: ~5.7V DC (stable for small devices)