

## **PAPER NUMBER 3**

**TITLE:** Optimal Charging and Discharging of Supercapacitors

**REFERENCE:** A. M. AbdelAty, M. E. Fouda, **Menna T. M. M. Elbarawy**, A. G. Radwan. Optimal Charging and Discharging of Supercapacitors. [Journal of The Electrochemical Society](#), Vol. (37); no. 11; 110521, July /2020

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### **ABSTRACT:**

In this paper, we discuss the optimal charging and discharging of supercapacitors to maximize the delivered energy by deploying the fractional and multivariate calculus of variations. We prove mathematically that the constant current is the optimal charging and discharging method under R s-CPE model of supercapacitors. The charging and round-trip efficiencies have been mathematically analyzed for constant current charging and discharging.

### **CONTRIBUTION OF THE APPLICANT:**

- Literature review.
- Ideas involved.
- The mathematical model and its solution..
- Analysis of the results.
- Writing up the manuscript.

### **CONTRIBUTION PERCENTAGE AND SIGNATURES OF COAUTHORS:**

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