

Roll No



**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023**

Semester : Semester IV - 2021

Course Code : EEE3036

Course Name : Sem IV - EEE3036 - Discipline Elective - II: Battery Management Systems

Program : EEE

Date : 16-JUN-2023

Time : 9.30AM -
12.30PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS

(10 X 3 = 30M)

1. If the capacity of a battery is 4000mAh, it can supply 4 Ampere current for -----Min.
(CO2) [Knowledge]
2. Define and explain the following battery parameters.
(i) Battery Coulometric capacity (ii) Discharge rate
(iii) State of Charge.
(CO3) [Knowledge]
3. State and define the key battery parameters (i) Battery capacity (ii) C rate (iii) SoC
(CO2) [Knowledge]
4. A 12 v battery is rated for 48 AH. If it must an average of 2A, how long will the battery last before it needs recharging.
(CO3) [Knowledge]
5. Specific Gravity of a electrolyte in a single cell or a battery is always----- and explain the same.
(CO3) [Knowledge]
6. Label the advantages of electric vehicles
(CO1) [Knowledge]

7. Outline the characteristics for a potential EV battery. (CO3) [Knowledge]
8. State the requirements of energy storage devices applied in automotive applications. Define and explain the following energy storage requirements.
(i) Specific Energy (ii) Specific Power (iii) Energy Efficiency (CO2) [Knowledge]
9. Summarize the cell chemistry of Li-ion battery. (CO1) [Knowledge]
10. What is the maximum storage temperature in degree centigrade of a Li-ion battery? (CO3) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

(3 X 10 = 30M)

11. Mr. Peter wants to apply serial bus communication to save copper wires in Electric Vehicle. Suggest any standard architecture with neat and clean diagram to send the data sequentially to communicate with other devices in BMS. (CO3) [Comprehension]
12. Illustrate Importance of a Battery Management System in EV (CO5) [Comprehension]
13. Ather 450X scooter having a battery capacity of 3.7kwhLithium ion battery with the nominal voltage of 51.1V. Design a battery pack (i) obtain the number of series (ii)Number of cells in parallel combination in battery pack. (iii) Total Number of cells required (CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

(2 X 20 = 40M)

14. Summarize the IoT-Based Battery Management System for EVs. (CO5,CO4) [Application]
15. A circuit is shown below to measure the temperature in the BMS. The resistor $R_1 = 100\text{k}\Omega$ which is fixed and resistor R_{therm} is a variable resistor which can be varied from $200\text{k}\Omega - 400\text{k}\Omega$.
- a) If the voltage $v = 100\text{volts}$ then find the value of v_{therm} when the value of variable resistor is $300\text{k}\Omega$. [10M]
- b) Also find the total current I flow through the circuit at $R_{therm} = 300\text{k}\Omega$. [5M]
- c) Find the value of R_{therm} if the resistor $R_1 = 100\text{k}\Omega$ and $v_{therm} = 60\text{ volts}$ ($v = 100\text{volts}$). [5M]
- (CO3,CO4) [Application]