

## ① Assignment

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Q1) Battery management system manages battery pack by protecting the battery from operating outside its safe operating zone by monitoring its state, controlling environment, balancing cells inside.

→ It track parameter like voltage, current, temperature.

→ Types of BMS,

### ① Hardware BMS

→ hardware BMS perform basic functions to keep battery pack function healthy as possible.

→ function include,

- over voltage cut-off
- under voltage cut-off
- continuous current
- over current detection
- over temp cut-off

### ② Software BMS

→ It has all the features of hardware BMS but additionally it collect data, can have memory to store the data and can transmit data via wireless communication.

## ② Technical parameter

### ① Battery cell monitors

- which primarily monitor the voltage for battery system. It has a high speed system that offers a low overall cost for high voltage monitoring.
- The easiest way to find battery pack's charge is to monitor individual cells.

### ② cut-off field effect transistor (FETs)

- FET driver is accountable for connection and isolation b/w load & charges of the battery pack. The behavior prediction is done through voltage, current measurement and real time circuitry.

### ③ Monitoring of temperature

- with increase in product requirements, the batteries have been on a constant surge in delivering current at fixed rate. The continuous operation causes a catastrophic event such as fire & explosion.

- Temp sensor monitor the energy storage system for compact portable application.

### ④ Cell voltage balance

- It's crucial to determine the health of battery pack. That is why cell voltage monitoring is done to ensure that the cells are in a proper running condition for long battery life.

- battery life is affected by the performance of the battery.

## (v) BMI algorithm

→ To make quick and effective decisions in real-time based on information received. For this a microcontroller for battery management system is needed to collect, organise and access the information from sensing circuitry.

## (vi) Real-time clock

→ Allowing the user to know the battery pack's behavior before any alarming event, the real-time clock acts as a black box system for time stamping and memory storage. The BMI electronics is kept away from synchronizing with the 3rd party battery pack through authentication.

## (3) Purpose with BMI communication

→ The main goal of BMI is to keep battery safe. Depending on the BMI IC being used to control your BM, you may need to connect to an external microcontroller or another ext. IC.

→ These ICs, needed to be able to communicate with each other to send and/or receive information from one x other. So communication protocols are vital for a battery management system with multiple ICs, to be able to communicate with each other.

## (1) → Universal Asynchronous Serial Transmitter (UART)

→ most widely used protocol, in BMI in the form of serial communication.

→ It's also used to communicate b/w GSM, Bluetooth or wifi module.

→ UART communicates data Asynchronously but baud rates.

## ② I2C - Inter-integrated communication

- which is a protocol used to communicate b/w IC to IC. It's intended a short-distance communication.
- I2C allows multi-master - multi-slave topology
- I2C is a standard bidirectional interface that uses a controller.

## ③ SPI - Serial Peripheral Interface

- It's a master-slave type protocol provides simple and low cost interface b/w a microcontroller and its peripherals.
- It uses a dedicated clock signal used to master device synchronize the transmit and receive or master & slave.

## ④ Controller Area network - CAN

- most widely used communication protocol in the automotive industry.
- high automotive application, due to the ~~high~~ remove all ~~sq.~~ noise.
- Also removes the heat of wire of harness.