1. What is BMS? Types of BMS and differentiate the types of BMS.

BMS (Battery Management System) manages a battery pack by protecting the battery from operating outside its safe operating zone by monitoring its state, controlling its environment, and balancing the Li-ion cells inside the battery pack. It can calculate data and report data via various communication protocols.

Types of BMS:-

- Hardware BMS: A hardware BMS performs basic protection functions to keep the battery pack functioning as healthy as possible
  - → Undervoltage cut-off.
  - → Overvoltage cut-off.
  - → Continuous current.
  - → Over current detection.
  - → Over temperature cut-off.
- Software BMS/ Smart BMS: It has all the features of the hardware BMS but additionally can collect data, can have memory to store data and can transmit data via CAN, Bluetooth, etc.

2. What are the technical parameters to keep in mind while procuring a BMS for assembling a battery pack?

Two major technical parameters are 'discharge cut-off voltage' and 'charging voltage'. Discharge cut-off voltage should be 2.0V - 2.5V, and charging voltage be at 3.65±0.03V, for Li-Ion-Phosphate batteries. While for Nickel Manganese Cobalt, end-of-discharge voltage is ~~2.8V~~ 2.5V - 2.8V, and end-of-charge voltage is 4.2V - 4.25V.

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3. What is the purpose of BMS with communication? What are the various protocols of communication used in a BMS?

- Communication is used for communication between devices. Eg. Between battery and vehicle control unit.
- It can continuously transmit data of the battery's thermal profile and monitor its temperature continuously.
- It uses the collected data points to estimate the SOC, SOH, etc. of the battery pack.
- The data can be stored, transmitted to the ECU, or sent to cloud.

Types of BMS Communication:

- CAN (Controlled Area Network).*
- Bluetooth.
- IoT Cloud Connectivity.
