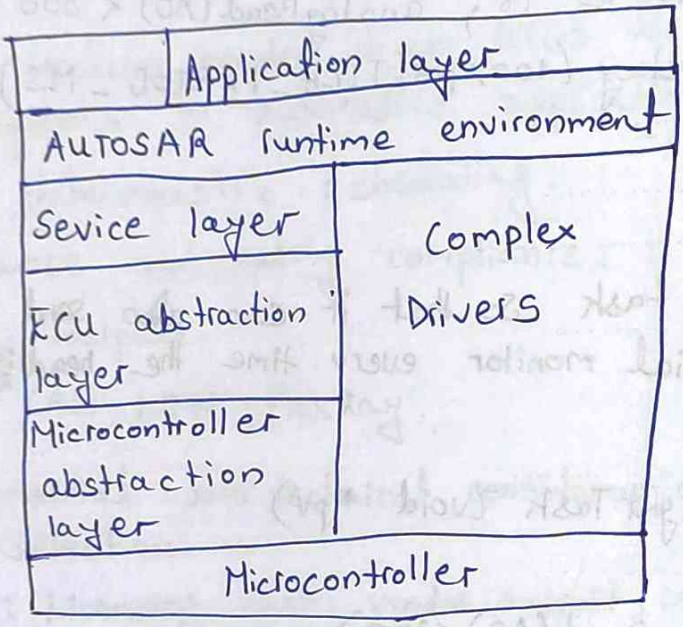
CO3 ALM

Q Draw the layered Architecture of AUTOSAR and write the path flow for a sound system in vehicles



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ALM - Quiz

Topics:

- Openloop / closed loop
- Stability
- ECU types
- Pillars of ECU
- Sensors & actuators
  - types
  - principles
  - characteristics
- processors
  - Architecture
  - Features
  - Comparision in family
- Network OSI layers
- Analytics
- Examples of ECU
- Autonomous Systems

Questions

1. Why LDR is an electrical transducer?
2. Why Ultrasonic sensor is digital?
3. What are essential characteristics of a good sensor?
4. Difference b/w sensor and transducer?
5. How environmental noise effects sensor performance?
6. Why do automatic street lights use LDR sensors instead of a manual switch?

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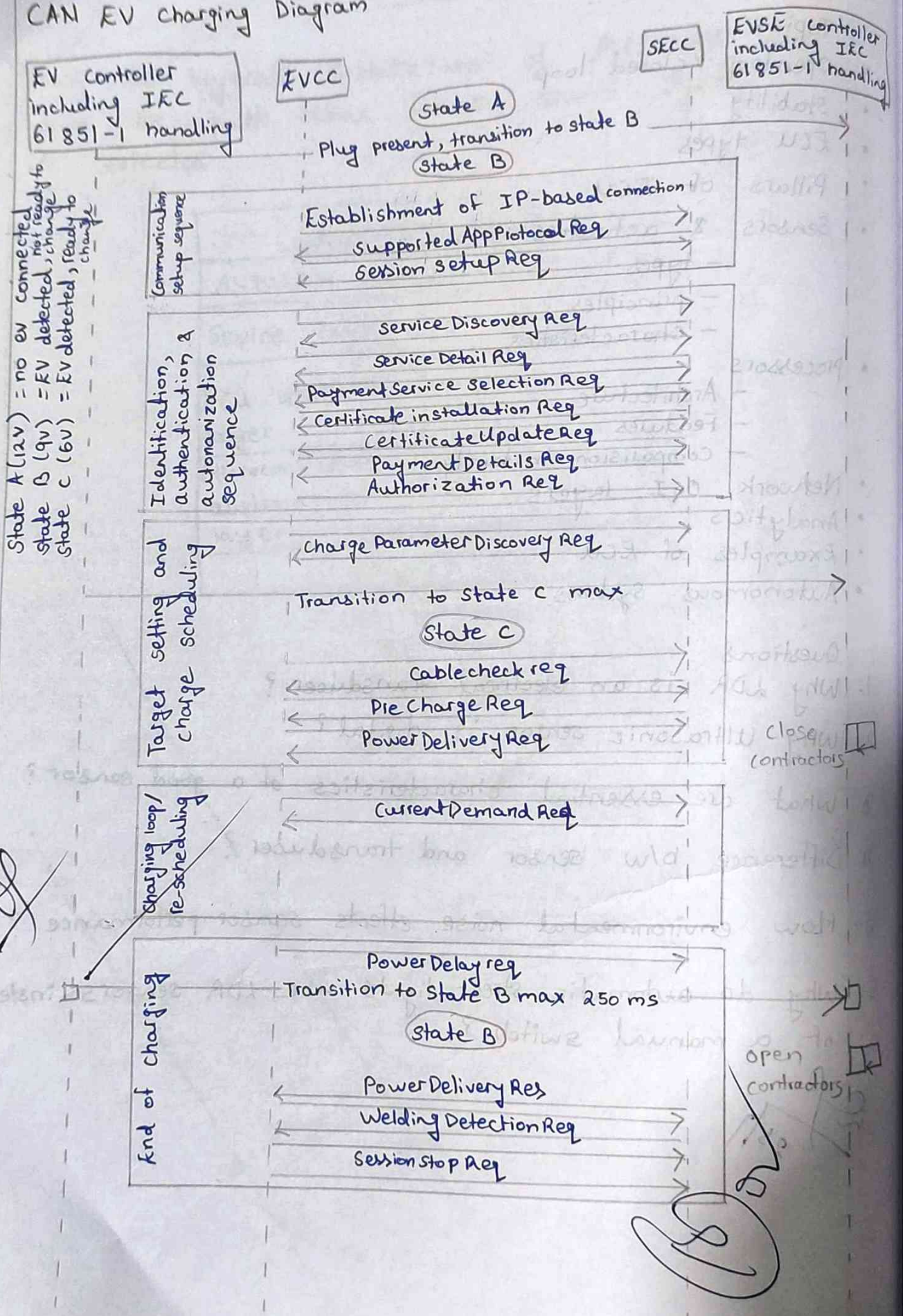
ALM

CAN EV charging Diagram



ALM

Actuator , Sensor , motor , LED , buzzer

1. Sensor
Sensors detect changes in the environment like light, temperature or motion and send signals.
eg. LM35 tempearature sensor , Ultrasonic sensor , PIR sensor

2. Actuator
An actuator receives signals and performs actions like moving, rotating or producing sound.
eg. LED , buzzer , motor

3. Motor
A motor is a type of actuator that converts electrical energy into mechanical motion for movement.

4. LED
An LED is a light-emitting diode that works as an output device, giving visual signals or indicators.

5. Buzzer
A buzzer is an actuator that converts electrical signals into sound, often used for alerts, alarms or notifications.

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4 Pillars of ECU

4 Pillars of ECU are :

1. Sensors & Actuators
2. Microcontroller / Processors Development Boards
3. Network / Protocol
4. Cloud & Data Analytics

1. Sensors
Collect real-time data from the vehicle, like speed, temperature or pressure

. Actuators
Execute commands from the ECU, such as controlling fuel injectors motors or valves.

2. Microcontroller / Processor Development Boards
Processes input from sensors and runs control algorithms to make decisions.

3. Network / Protocol
Handles communication with other ECUs or vehicle systems.
Ensures reliability, timing and error-checking in signal transmission.

4. Cloud & Data Analytics
Cloud - Provides online storage and computing for easy access and scalability

Data analytics - Processing data to extract insights and support decisions.

ALM

Sensor Datasheet

LM35 Temperature sensor

- LM35 is a precision temperature sensor with an analog output voltage linearly proportional to the celsius temperature
- It doesn't require external calibration.

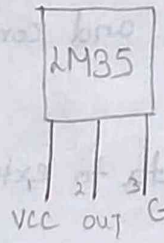
Key Features

1. Temp. range : -55°C to +150°C
2. Accuracy : ±0.5°C at 25°C
3. Low-self heating
4. operates from 4V to 30V supply.
5. Low cost.

Applications :

1. Industrial equipment
2. Battery monitoring
3. Embedded system temperature monitoring.
4. HVAC temperature control.

Pin Diagram



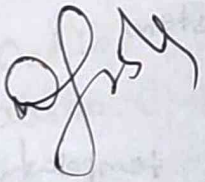
1 - VCC

2 - Analog OUT

3 - GND

Key specifications

Parameter	Value
Supply voltage	4V - 30V
Output voltage scale	10mV/°C
Measurement range	-55°C to +150°C
Accuracy	± 0.5°C (at 25°C)
Output impedance	0.1 Ω
Typical current draw	60 μA
Package Type	TO-92, SO-8, TO-220
Linearity	± 0.25°C (typical



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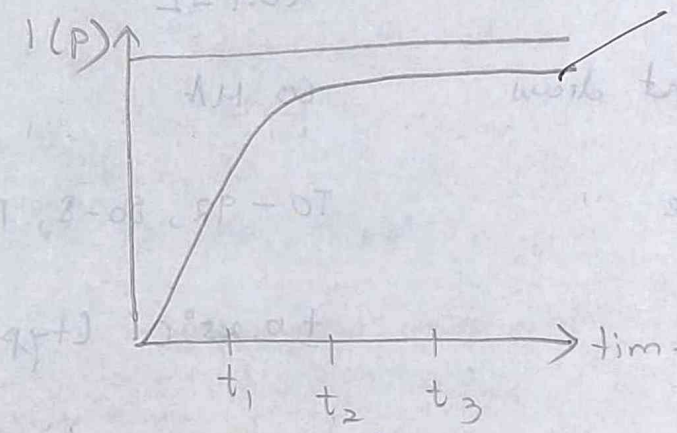
ALM-7 COH - ALM

Q Draw the Step response of asynchronous system. Identify the all possible responses.
[Diagram & notation]

Q Take an example and illustrate the before and after affects of digital controllers

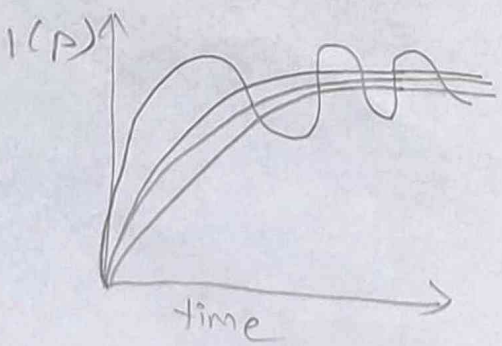


Temperature control system

Before analog controllers
The controller continuously compares the temperature with the set point.

Temp. drops ↑ Relative volvage } effects accuracy, stability flexibility
After using Digital controller

ADC : converts temp. signal to digital signal



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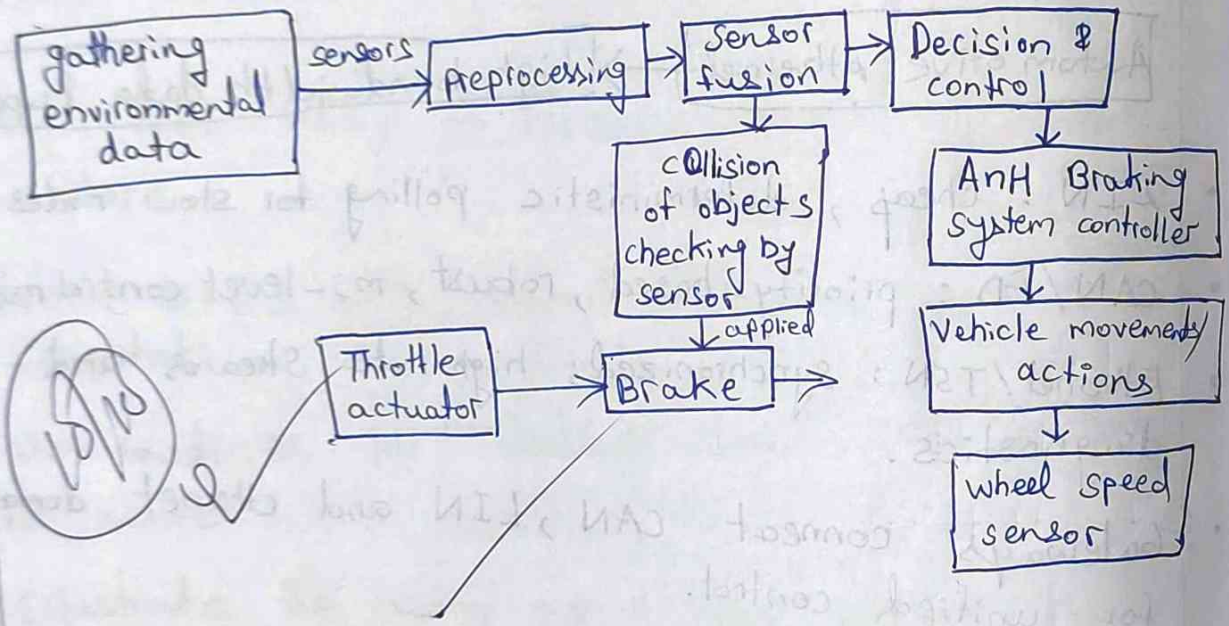
AIM 8

1. Draw the Block diagram of following systems & Algorithm

(i) Driving and braking system
(ii) Battery management system
(iv) OBD system (on-Board Diagnostic)

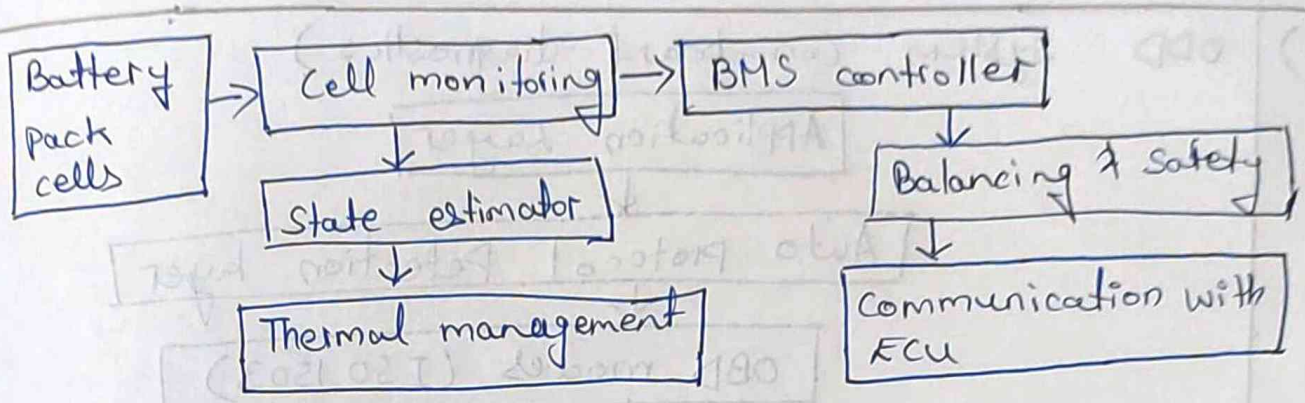
(i)



Algorithm:

1. Data is acquired by the data from all the sensors.
2. The next preprocessing in which the signals are aligned and filtered.
3. In sensor fusion it estimates object distance (proximity) & vehicle state.
4. It evaluates Time to collision to trigger if AEB is required.
5. The we apply the braking using the AEB to strictly lock the wheel from movement.

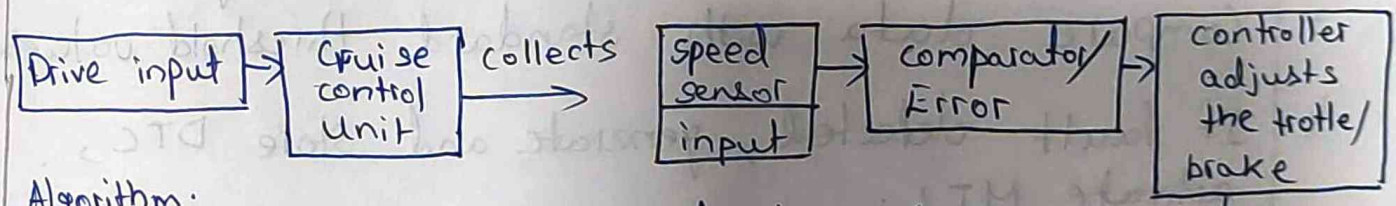
ii)



Algorithm:

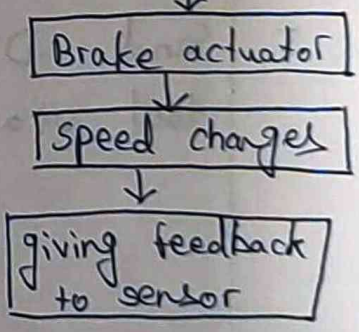
1. Read the voltage, current and temperature values of each cell.
2. Check whether all are in working condition
3. Estimate the battery status & health.
4. Manage charging/discharging & cooling/heat systems.
5. Communicate with system data to ECU through CAN.

iii)

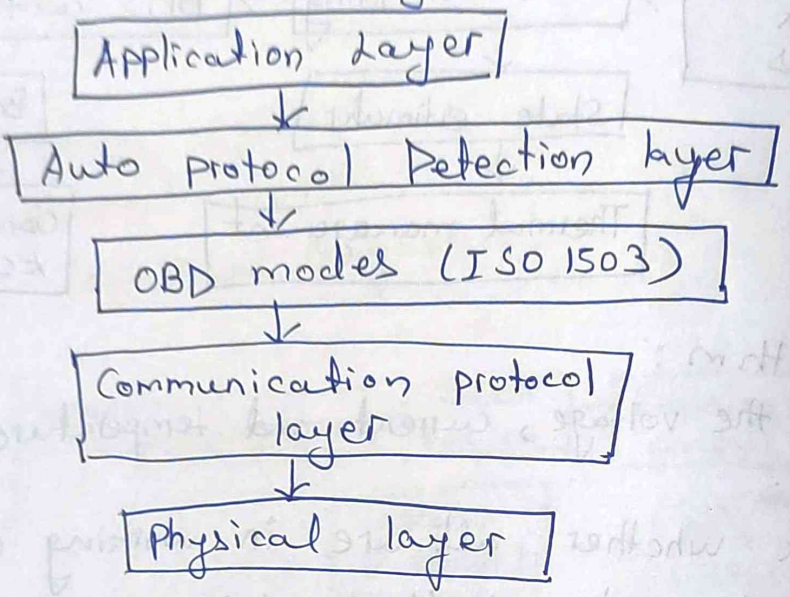


Algorithm:

1. Take the input of the speed chosen by driver.
2. Measure the actual vehicle speed using sensor.
3. Adjusting the throttle accordingly if actual < desired then reduce throttle
4. Repeat continuously.



iv) ODD System (on-board diagnostics)



Algorithm:

1. Initialize ECU and detect communication protocol.
2. Collect sensor data from vehicle subsystems.
3. Compare data with standard threshold values.
4. If fault detected, generate and store DTC, activate MIL.
5. Send DTCS and live data to diagnostic tool via OBD port.