

* Stafgaw, SimScope

Assessment

weightage is marks
10

Sum of Demo

Expt

Exercise

12

Expt

Structured

Understanding of Automotive Electronics 6th Ed.
Automobile
Advance

Automotive electronics:- Automotive electronics are the electronics used in automobiles either to replace the existing mechanical component or/and control.

why do we need electronics in car?

Fuel efficiency

Exhaust particle

Control the temp inside engine

high power

high torque

Control Knocking

} ECM

ECM:- The engine control module is an electronic control unit that manages the engine's performance. It monitors various sensors & adjust fuel injection, ignition

time & other critical inputs to optimise fuel efficiency & reduce emissions.

high torque:- means the shortest possible delay b/w driver pressing the gas paddle & the engine rev revving

Knocking:- occurs when fuel burns unevenly in the engine.

- 1. Vehicle Slip control.
- 1. over steering control.
- 1. under steering control.
- 1. Vehicle roll over control.
- 1. reduces stopping distance.
- 1. Brake distribution.

Anti-lock Braking ABS, TCS
Traction Control
& ESP
Electronic Stability Program

- 1. vehicle interior lighting
- 1. vehicle exterior lighting
- 1. Automatic Door lock.
- 1. power windows
- 1. remote Key

BCM
Body Control Mod

non critical applications

Driver information & entertainment radio

Comfort & convenience

eg electric windows, clipper/washer, seat heat central locking, interior light control.

Low Intelligence Electronic System.
Minor Communication b/w systems.

(push button control)

No impact on engine performance.

No impact on driving & driver skills

TCS: - Traction control system is safety system that detects when car's wheel slips & loses grip on the road. The system then automatically slows slipping wheels speed

ESP: - Electron

stabilisation to decide whether the car's direction of travel corresponds with steering input & if it doesn't automatically brings it by in your control in a fraction of sec

BCM: -

ABCM is a comprehensive system that communicates & integrates the work of all electronic modules through the vehicle. But

ABCM is to control load Auto electronic unit

Electronics Support: Critical Application

Engine optimisation.

Efficiency improvement & pollution control.

Active & passive safety

ABS, ESP, Airbags, Xenon lamps

Driver information & entertainment
Radio, GPS, parking radar

comfort, convenience, & security
cruise control

Automatic Indulge domain structure
infotainment

Body electronics

chassis & drivetrain
assistance

Power train

Safety system

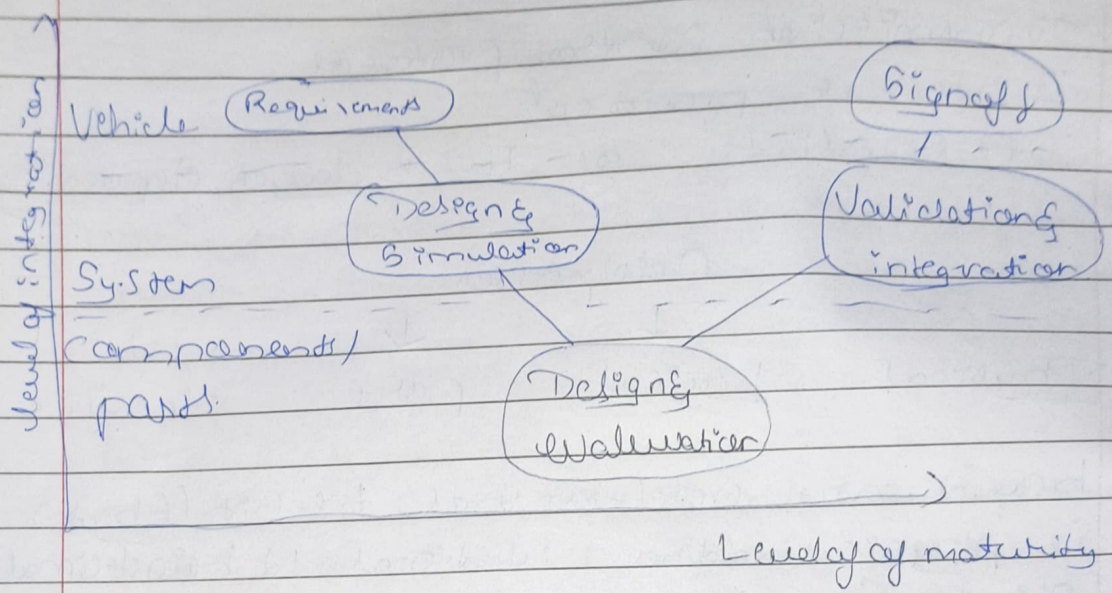
X — X —

X — X —

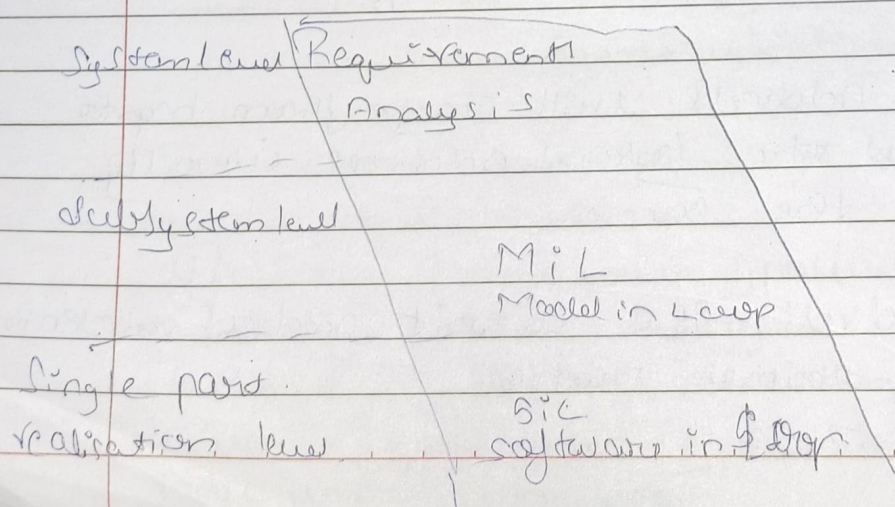
IPv4 address :- It is a unique 32 bit (2³² address) & it is dotted-decimal notation & binary notation
 128.11.3.31

10000000	00001011	00000011	00011111
↓		↓	↓
0-255	0-255	0-255	0-255

* Classical V Model of Development

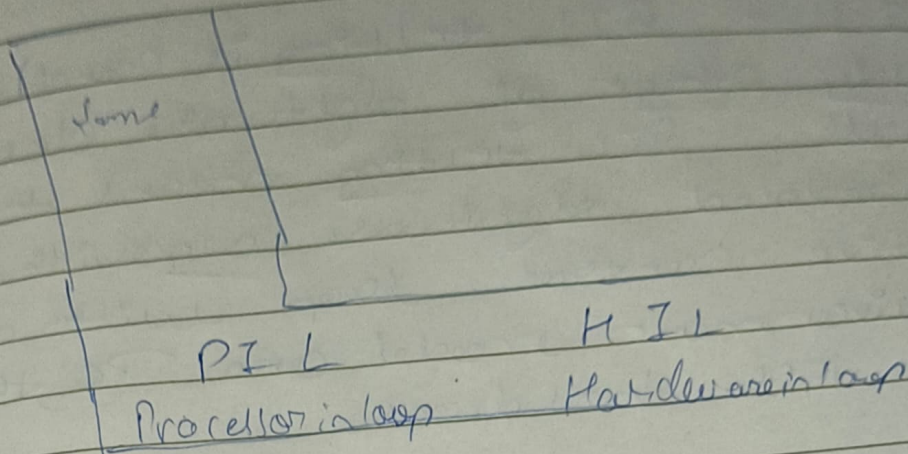


Level 1



Code generation & optimization

Level 2:



* Vmodel :- Vmodel summarizes the main steps to be taken in function with the corresponding deliverables within computerized system validation framework or project life cycle development. It describes the activities to be performed & results that have to be produced during product development.

* Multidomain modeling :- is a model of different disciplines assembled into large simulation model. These are generally related to mechanical, electronics, electrical, hydraulic, pneumatic & others.

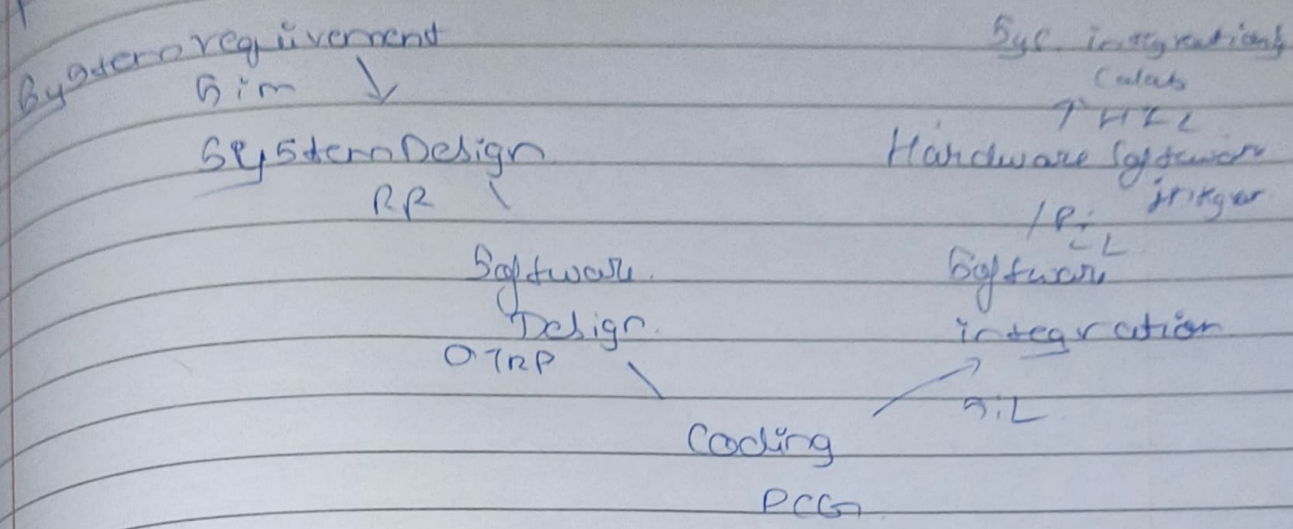
* MIL :- Model in Loop :- An automotive manufacturer might use MIL testing to evaluate functionality of new engine control system before it is implemented in a prototype vehicle.
eg:- A test engineer can use an MIL simulation to test the functionality of a new

Autonomous driving algorithm

- *] SIL:- SIL testing is conducted in the early stage of software development process. SIL testing means testing embedded software algorithmic logic control loop with or without environment model on a PC, but without ECU hardware.
- *] PIL:- Testing refers to the testing & validation of the embedded software on the processor that will later be used in the ECU. The algorithms & functions are usually developed on a PC within a development environment either directly in C-program, C++, or model based.
- *] HIL:- Testing is a technique where real signals from a controller are connected to a test system that simulates reality or checking the controller into thinking it is in the assembled product. Testing & design iterations take place as long as the real world system is being used we can easily run through thousands of possible scenarios to properly determine for a controller without the cost & time associated with actual

physical

Embedded System Software Development process



- Sim : Simulation
- PR -> Rapid prototyping
- OTRP - On target Rapid prototyping
- PCG : Production Code generation
- SZL : Software in the loop testing
- PZL -> Processor testing
- HZL -> Hardware testing

- Mechanical parts of vehicle
- Engine
- Transmission unit
- Braking unit
- Steering unit
- Differential gear
- Suspension unit