Chapter-6

Developing Microprocessor Based Products

- An Introduction to the design process
- Preparing the Specification
- Developing a Design
- Implementing and testing the design
- Regulatory Compliance testing
- Design Tools for Microprocessor Development

Design Process

The steps to develop a complete microprocessor based product are the same as those to develop the software for that product;

➢ Write a specification

➢ Create a design

➢ Implement the design and test and correct the implementation

➢ Demonstrate the final product

Design Process

- Only small microprocessor –based products are entirely designed by one individual.

- Larger products require a team effort.

- Typical skill required to develop a microprocessor based product include electronic , software and mechanical.

- If there are several engineers assigned to develop project, then one of them is usually assigned the job of project manager.

Design Process

- Engineering technicians and product developers assist the engineers with the development project. They often are responsible for:

✓ Circuit board layout

✓ Constructing models

✓ Testing

✓ documentation

✓ Interdepartmental transfers

Preparing the Specification

First step in developing a product is to create a specification.

- The engineering often must develop an exoandede version of the specificatio suplied be marketing is:

The selection of hardware specfiications must be recorded so that all of the development team know decisions.

Preparing the Specification

- Typically the digital design engineer must create the digital circuit specifications by working with the software engineer.

- Often it is difficult to see the difference between the end of the specification phase of a development project and the beginnings of the effort.

Developing a design

The main purpose for the design phase of any development process is to:

✓ Describe a way the functional requirements and specifications in the specification can be implemented

✓ Select components which connected together make a product meeting the required functions and specifications.

✓ Provide a model which can be reviewed analytically to ensure theeoretical compliance with the specifications under worse conditions.

Developing a design

- The purpose of developing a digital design begins with a high level description of the digital system .

- When designing the shortwave radio, the digital design engineer worked closest with the **Software engineer** (ROM and RAM)

Developing a design

One of the best design techniques for software development is a piecewise or top down design. This process is also applicable to the design of

✓ Analog ckts

✓ Digital ckts

✓ Mechanical designs

Implementing and Testing the Design

A principle task in the implementation phase is the :

✓ Testing of various models to make sure they comply with the specifications.

✓ Finalising the drawing package

✓ The construction of different levels of model to show that the design makes a product meeting the desired specifications.

Implementing and Testing the Design

- Breadboards are often constructed in a "haywire" fashion to show the ckts perform the intended function, but often do not show the intended physical charateristics.

- The main difference between an engineering model and an engineering prototype is that the engineering model is often built, where as the engineering prototype is often built with early sample of tooled parts.

Regulatory Compliance testing

- The reason microprocessor based products used by the general consumer must comply with part 15, subpartJ for class B computin devices of the FCC rules is that

❑ An improperly designed product with digital ckts can radiate sufficient energy ti interface with the legitimate use of radio receivers or TVs.

Regulatory Compliance testing

- Although final testing to determine compliance with part 15 must be performed by a certified lab, any work done to minimize radiation before the compliance testing is performed , saves the potential expense of retesting.

Regulatory Compliance testing

- You would expect an externally connected intelligent modem which operates from 120 Vac to meet requirements set forth by the

✓ FCC part 15, subpart J

✓ FCC part 68

✓ Underwriters Laboratories

Design Tools for Microprocessor Development

- An MDS is only used to troubleshoot design errors in microprocessor based products.
- The shortest event shown on a logical analyzer display in the timing mode depends on the sampling rate.
- A logic analyzer has two main display modes: timing and state. The information displayed in the timing mode: looks very much like a multiple trace display on an oscilloscope, but is really a view of the data stored in the logic analyzer memory.

Design Tools for Microprocessor Development

- One major difference between the logic analyzer and the oscilloscope is :

✓ A logic analyzer displays many more channels of information

✓ An oscilloscope displays a signal amplitude versus time, whereas a logical analyser displays logic level versus time.

Design Tools for Microprocessor Development

- We set the logic analyzer to pretriggering when we want to see the data which immediately precedes the trigger word.

- Common MDS feature include

✓ A single step mode

✓ Breakpoint

✓ Tracing

✓ Software development