## CHAPTER-1

5. Name and describe the four development models which most embedded projects are based upon.

Most of these models are based upon one or some combination of the following development models:

- The *big-bang* model, in which there is essentially no planning or processes in place before and during the development of a system.
- The *code-and-fix* model, in which product requirements are defined but no formal processes are in place before the start of development.
- The *waterfall* model, in which there is a process for developing a system in steps, where results of one step flow into the next step.
- The *spiral* model, in which there is a process for developing a system in steps, and throughout the various steps, feedback is obtained and incorporated back into the process.

6. [a] What is the Embedded Systems Design and Development Lifecycle Model [draw it]?
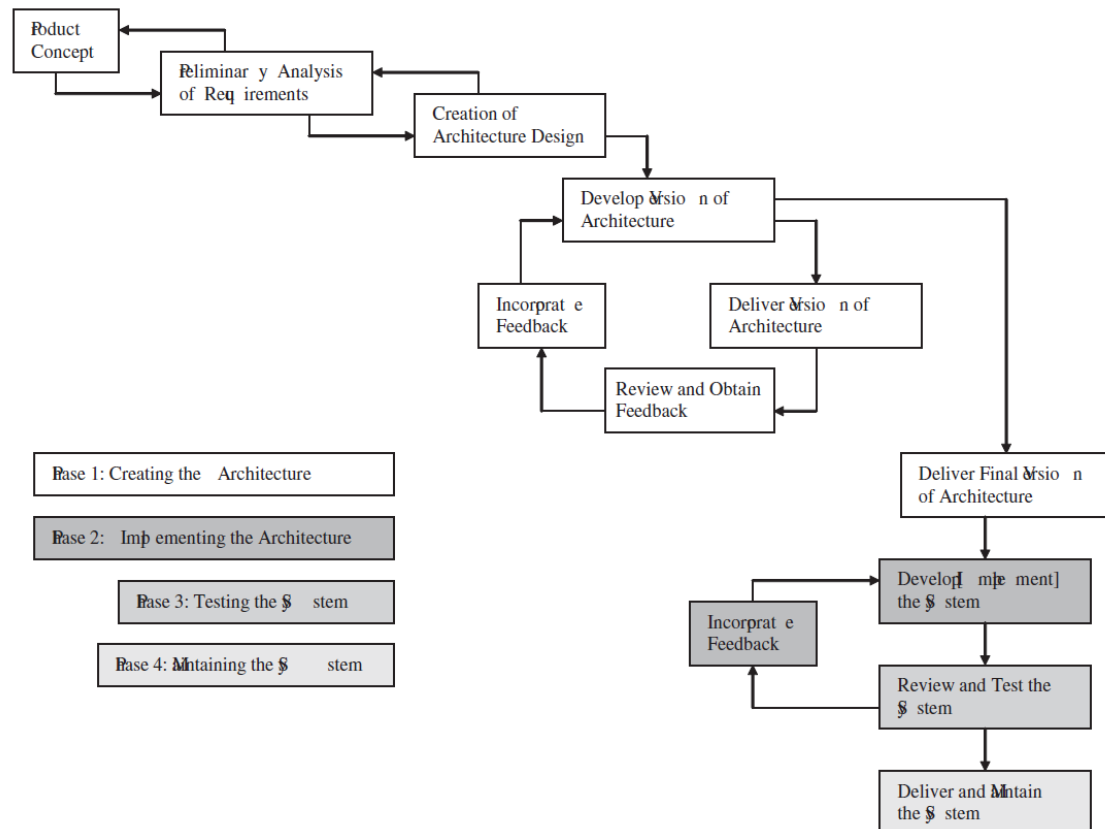
[b] What development models is this model based upon?

This book supports the model shown in Figure 1-1, which I refer to as the Embedded Systems Design and Development Lifecycle Model. This model is based on a combination of the popular waterfall and spiral industry model.

[c] How many phases are in this model? 4

[d] Name and describe each of its phases. Refer diagram.

7. Which of the stages below is not part of creating an architecture, phase 1 of the Embedded Systems Design and Development Lifecycle Model?
A. Understanding the architecture business cycle.
B. Documenting the architecture.
C. Maintaining the embedded system.
D. Having a strong technical foundation.
E. None of the above.

15. [a] What is the Embedded Systems Model?
At the highest level, the primary architectural tool used to introduce the major elements located within an embedded system design is referred to as the Embedded Systems Model.
[b] What structural approach does the Embedded Systems Model take?
This reference model is essentially a layered (modular) representation of an embedded systems architecture from which a modular architectural structure can be derived.
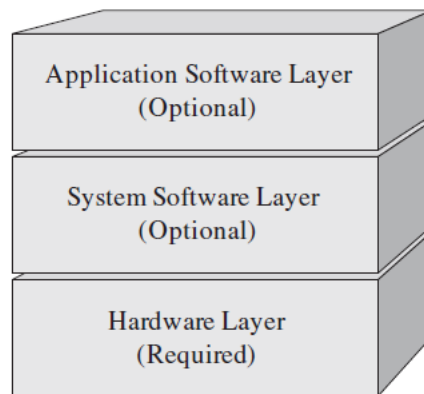[c] Draw and define the layers of this model.

Figure 1-2: Embedded Systems Model

[d] Why is this model introduced?
For two main reasons:
1. *The visual representation of the main elements and their associated functions.*
2. *Modular architectural representations are typically the structures leveraged to structure the entire embedded project.*

CHAPTER-2

19. [a] What is the OSI model?
To demonstrate the dependencies between the internal networking components of an embedded system and the network's architecture, the distance between connected devices, and the transmission medium connecting the devices, this section associates networking components with a universal networking model, in this case the Open Systems Interconnection (OSI) Reference model.
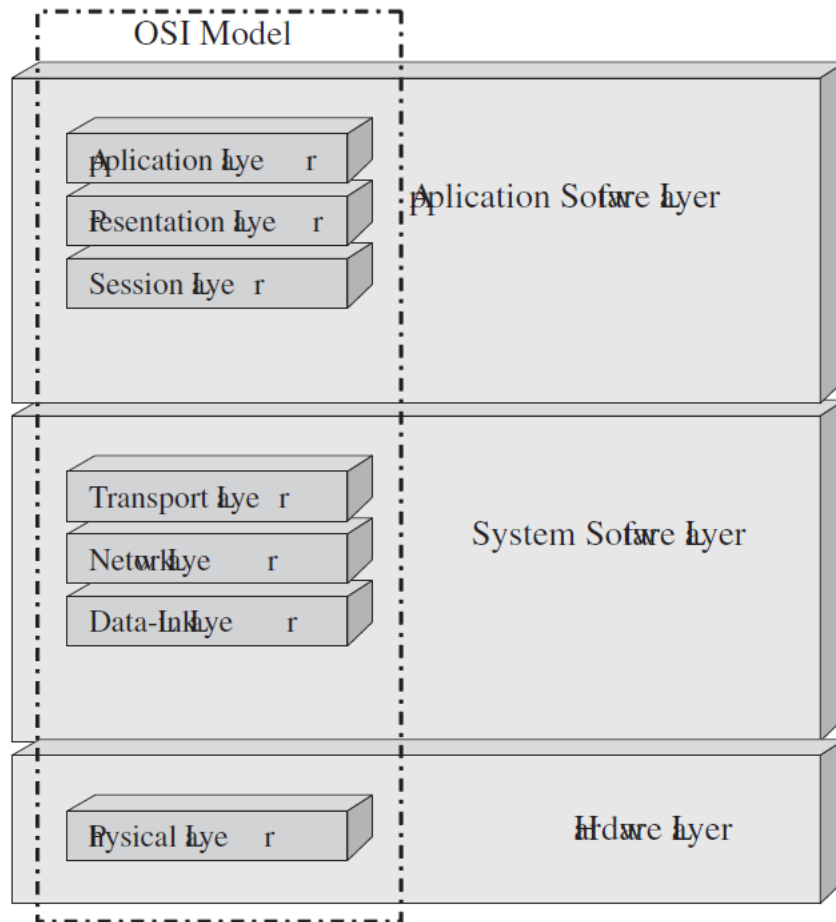[b] What are the layers of the OSI model?

Figure 2-22: OSI and Embedded Systems Model block diagram

[c] Give examples of two protocols under each layer.
1. **Physical Layer:** Ethernet, USB (Universal Serial Bus)
2. **Data Link Layer:** PPP (Point-to-Point Protocol), HDLC (High-Level Data Link Control)
3. **Network Layer:** IP (Internet Protocol), ICMP (Internet Control Message Protocol)
4. **Transport Layer:** TCP (Transmission Control Protocol), UDP (User Datagram Protocol)
5. **Session Layer:** NetBIOS (Network Basic Input/Output System), PPTP (Point-to-Point Tunneling Protocol)
6. **Presentation Layer:** JPEG (Joint Photographic Experts Group), SSL/TLS (Secure Sockets Layer/Transport Layer Security)
7. **Application Layer:** HTTP (Hypertext Transfer Protocol), SMTP (Simple Mail Transfer Protocol)

[d] Where in the Embedded Systems Model does each layer of the OSI model fall? Draw it.
Same diagram

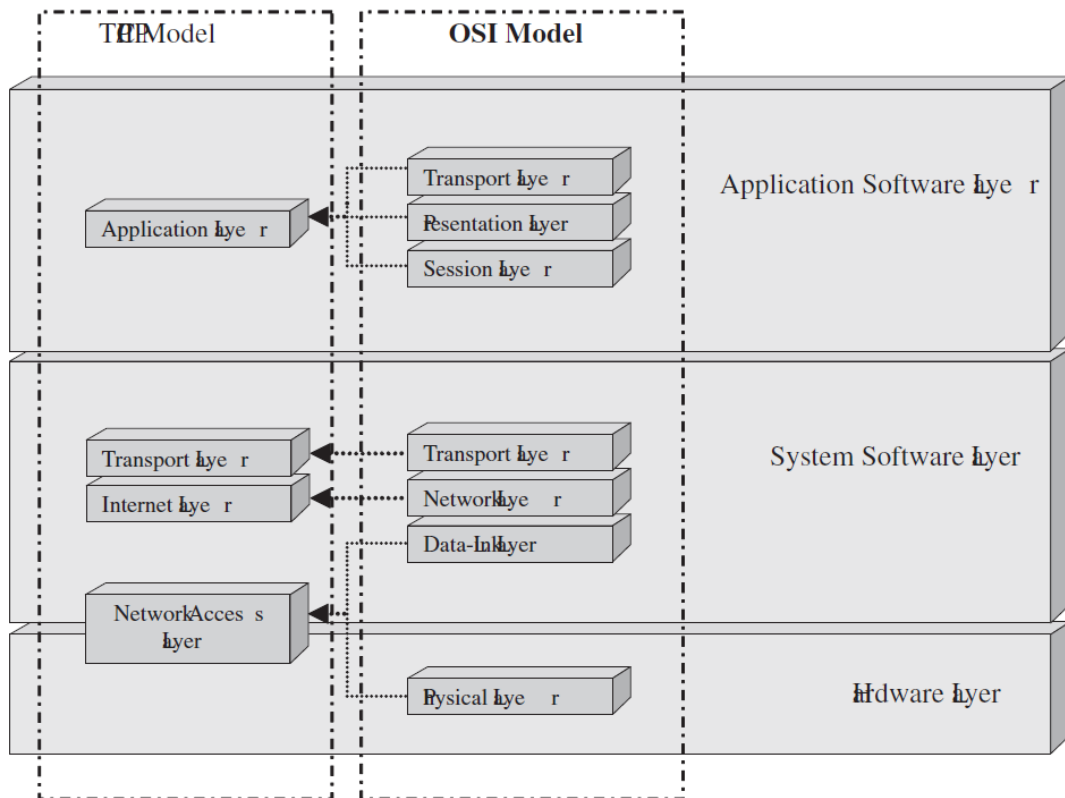20. [a] How does the OSI model compare to the TCP/IP model?

Figure 2-25: TCP/IP, OSI models and Embedded Systems Model block diagram

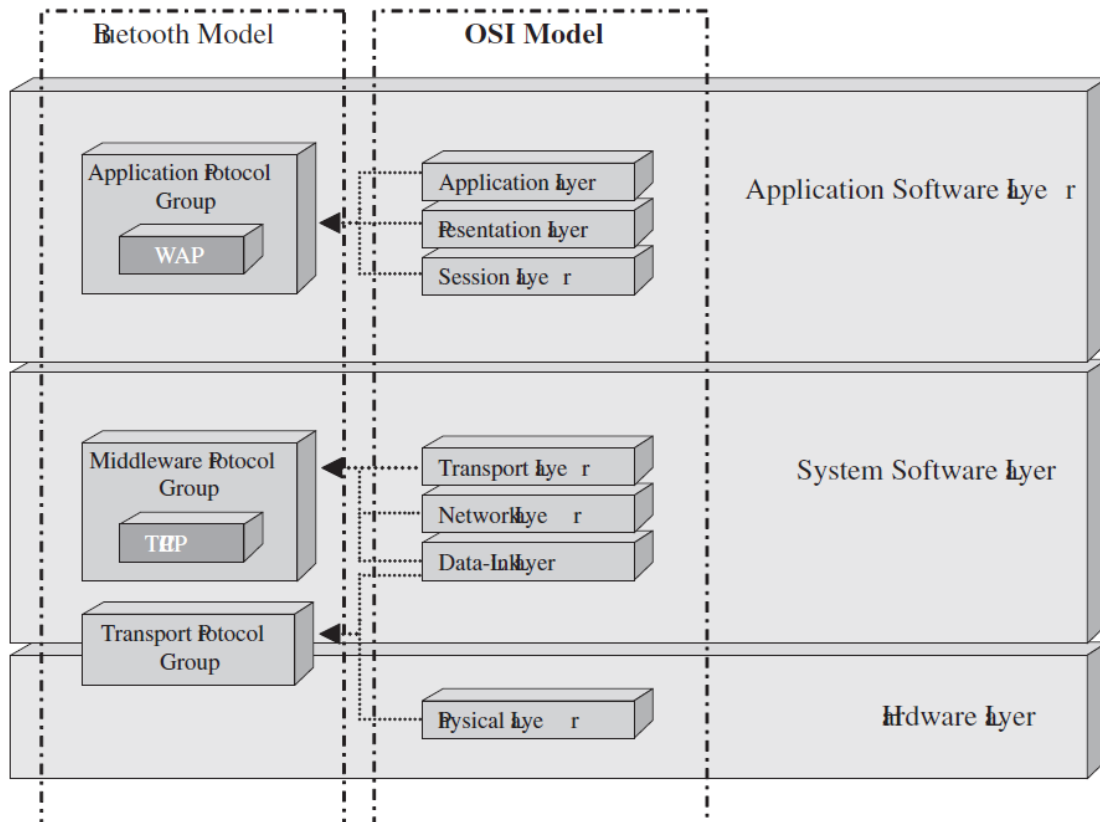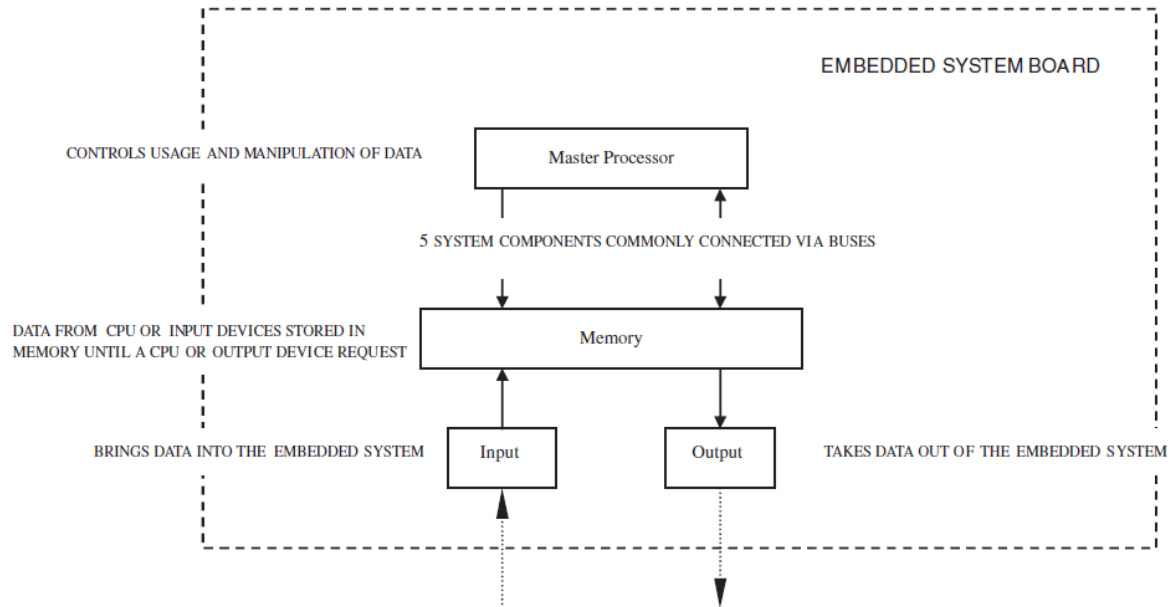[b] How does the OSI model compare to Bluetooth?

Figure 2-27: Bluetooth, OSI and Embedded Systems Model block diagram

CHAPTER-3

1. [a] What is the von Neumann model?
The von Neumann model is a result of the published work of John von Neumann in 1945, which defined the requirements of a general-purpose electronic computer.

[b] What are the main elements defined by the von Neumann model?
In embedded devices, all the electronics hardware resides on a board, called printed circuit board (PCB).
Major hardware components of most boards can be classified into five major categories:
- **Central Processing Unit (CPU)** – the master processor
- **Memory** – where the system's software is stored.
- **Input Device(s)** – input slave processors and relative electrical components.
- **Output Device(s)** – output slave processors and relative electrical components.
- **Data Pathway(s)/Bus(es)** – interconnects the other components, providing a "highway" for data to travel on from one component to another, including any wires, bus bridges, and/or bus controllers.

CHAPTER-4

3. [a] What are the basic materials that all components on an embedded board are composed of?