

## UNIT II - COMBINATIONAL LOGIC

### Part A – 2 Marks

#### 1. Define Combinational circuit

A combinational circuit consist of logic gates whose outputs at anytime are determined directly from the present combination of inputs without regard to previous inputs.

#### 2. Explain the design procedure for combinational circuits

- x Determine the number of available input variables & required O/P variables.
- x Assigning letter symbols to I/O variables
- x Obtain simplified Boolean expression for each O/P.
- x Obtain the logic diagram.

#### 3. What is code conversion?

If two systems working with different binary codes are to be synchronized in operation, then we need digital circuit, which converts one system of codes to the other. The process of conversion is referred to as code conversion.

#### 4. What is code converter?

It is a circuit that makes the two systems compatible even though each uses a different binary code. It is a device that converts binary signals from a source code to its output code. One example is a BCD to Xs3 converter.

#### 5. Analysis procedure for combinational circuits

- x Find the given circuit is combinational or sequential.
- x Combinational circuit has a logic gate with no feedback paths or memory elements.
- x A feedback path is a connection from the output of one gate to the input of second gate that forms part of the input to the first gate

#### 6. Design procedure for combinational circuits

- i) Determine the required number of inputs and outputs and assign a symbol to each.
- ii) Derive the truth table that defines the required relationship between inputs and outputs.
- iii) Obtain the simplified Boolean functions for each output as a function of the input variables.
- iv) Draw the logic diagram and verify the correctness of the design.

**7. What is a half-adder?**

The combinational circuit that performs the addition of two bits is called a half-adder.

**8. What is a full-adder?**

The combinational circuit that performs the addition of three bits is called a full-adder.

**9. What is half-subtractor?**

The combinational circuit that performs the subtraction of two bits is called a half-subtractor.

**10. What is a full-subtractor?**

The combinational circuit that performs the subtraction of three bits is called a half-subtractor.

**11. What is Binary parallel adder?**

A binary parallel adder is a digital function that produces the arithmetic sum of two binary numbers in parallel.

**14. Logic equation for half adder****15. Limitations of Half-adder**

In multidigit addition, add two bits along with the carry of previous digit addition. Effectively such addition requires addition of three bits. This is not possible with half adder. Hence, half-adders are not used in practice.

**16. Limitations of Half-adder**

In multidigit subtraction, subtract two bits along with the borrow of previous digit subtraction. Effectively such subtraction requires subtraction of three bits. This is not possible with half subtractor.

**17. Define Hardware Description Language (HDL)**

The size and complexity of the digital systems increases, they cannot be designed manually; their design is highly complex. At the most detailed level, they may consist of millions of elements (i.e.) transistor or logic gates. So the computer-aided tools are used to design the Hardware Description Language.

**18. Structure of Verilog module**

```
module <module name> <port
list>; <declares>
<module
items>
endmodule
```

**19. Operators in Verilog**

**HDL** x Boolean

logical

- x Unary reduction logical
- x Bitwise logical
- x Relational
- x Binary arithmetic
- x Unary arithmetic

**20. What are the Verilog data types?**

reg and wire

reg variables store the last value that was procedurally assigned to them whereas the wire variables represent physical connections between structural entities such as gates.

**21. What is BCD adder?**

A BCD adder is a circuit that adds two BCD digits in parallel and produces a sum digit also in BCD.

**22. What is Magnitude Comparator?**

A Magnitude Comparator is a combinational circuit that compares two numbers, A and B and determines their relative magnitudes.

**23. What is decoder?**

A decoder is a combinational circuit that converts binary information from 'n' input lines to a maximum of  $2^n$  unique output lines.

**24. What is encoder?**

An encoder is a combinational circuit that converts binary information from  $2^n$  Input lines to a maximum of 'n' unique output lines.

**25. Define Multiplexing**

Multiplexing means transmitting a large number of information units over a smaller number of channels or lines.

**26. What is Demultiplexer?**

A Demultiplexer is a circuit that receives information on a single line and transmits this information on one of  $2^n$  possible output lines.

**27. What is the function of the enable input in a Multiplexer?**

The function of the enable input in a MUX is to control the operation of the unit.

**28. Give the applications of Demultiplexer.**

Multiplexing means transmitting a large number of information units over a smaller number of channels or lines.

**29. What is priority encoder?**

A priority encoder is an encoder that includes the priority function. The operation of the priority encoder is such that if two or more inputs are equal to 1 at the same time, the input having the highest priority will take precedence.

**30. Can a decoder function as a Demultiplexer?**

- i) It finds its application in Data transmission system with error detection.
- ii) One simple application is binary to Decimal decoder.

**31. Mention the uses of Demultiplexer**

Demultiplexer is used in computers when a same message has to be sent to different receivers. Not only in computers, but any time information from one source can be fed to several places.

**32. List basic types of programmable logic devices.**

- . Read only memory
- . Programmable logic Array
- . Programmable Array Logic

**33. List out the applications of multiplexer**

The various applications of multiplexer are

- a. Data routing.
- b. Logic function generator.
- c. Control sequencer.
- d. Parallel-to-serial converter.

**34. List out the applications of decoder**

The applications of decoder are

- a. Decoders are used in counter system.
- b. They are used in analog to digital converter.
- c. Decoder outputs can be used to drive a display system.

**35. Give other name for Multiplexer and Demultiplexer. x Multiplexer is otherwise called as Data selector.**

x Demultiplexer is otherwise called as Data distributor.

**36. What is logic synthesis? (May/June 2011)****37. What are the modeling techniques in HDL? May/June 2013,2012****38. Give the need for using carry look ahead adder (nov/dec 2011)**

x Ans: To reduce the carry propagation delay and to reduce the complexity in designing combinational circuits

**39. Construct 4x16 decoder using 3x8 decoders. (Nov/dec2012)****40. Implement full adder using 2 half adders (Nov/dec2012)**