SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Coimbatore-35

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
16EE203 – LINEAR AND DIGITAL CIRCUITS

UNIT IV – COMBINATIONAL AND SEQUENTIAL CIRCUITS

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
- Determine the number of available input variables & required O/P variables.
- Assigning letter symbols to I/O variables
- Obtain simplified Boolean expression for each O/P.
- 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
Find the given circuit is combinational or sequential.
Combinational circuit has a logic gate with no feedback paths or memory elements.
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. State the 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 halfsubtractor.

10. What is a full-subtractor?
The combinational circuit that performs the subtraction of three bits is called a halfsubtractor.

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.

12. 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.

13. 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.

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

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

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

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

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

19. 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.

20. Give the applications of Demultiplexer.
Multiplexing means transmitting a large number of information units over a smaller number of channels or lines.

21. 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.

22. 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.

23. 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.

24. List basic types of programmable logic devices.
. Read only memory
. Programmable logic Array
. Programmable Array Logic

25. 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.

26. 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.

27. Give other name for Multiplexer and Demultiplexer.
- Multiplexer is otherwise called as Data selector.
- Demultiplexer is otherwise called as Data distributor.

28. What is sequential circuit?
Sequential circuit is a broad category of digital circuit whose logic states depend on a specified time sequence. A sequential circuit consists of a combinational circuit to which memory elements are connected to form a feedback path.

29. List the classifications of sequential circuit.
i) Synchronous sequential circuit.
ii) Asynchronous sequential circuit.

30. What is Synchronous sequential circuit?
A Synchronous sequential circuit is a system whose behavior can be defined from the knowledge of its signal at discrete instants of time.

31. What is a clocked sequential circuit?
Synchronous sequential circuit that use clock pulses in the inputs of memory elements are called clocked sequential circuit. One advantage as that they don't cause instability problems.

32. What is called latch?
Latch is a simple memory element, which consists of a pair of logic gates with their inputs and outputs inter connected in a feedback arrangement, which permits a single bit to be stored.

33. List different types of flip-flops.
i) SR flip-flop
ii) Clocked RS flip-flop
iii) D flip-flop
iv) T flip-flop
v) JK flip-flop
vi) JK master slave flip-flop

34. What do you mean by triggering of flip-flop?
The state of a flip-flop is switched by a momentary change in the input signal. This momentary change is called a trigger and the transition it causes is said to trigger the flip-flop.

35. What is an excitation table?
During the design process we usually know the transition from present state to next state and wish to find the flip-flop input conditions that will cause the required transition. A table which lists the required inputs for a given chance of state is called an excitation table.

36. Give the excitation table of JK-flip flop?
Present state Next state Flip-flop Inputs
Qn Qn+1 J K
0 0 0 X
0 1 1 X
1 0 X 1
1 1 X 0

37. Give the excitation table of SR-flip flop?
Present state Next state Flip-flop Inputs
Qn Qn+1 R S
0 0 X 0
0 1 0 1
1 0 1 0