

Digital Electronics Tasks Completed

by Mohammad Mahdi

Submission date: 22-May-2023 02:44PM (UTC+0100)

Submission ID: 207194448

File name: 45027_Mohammad_Mahdi_Digital_Electronics_Tasks_Completed_500362_1882238020.docx
(267.74K)

Word count: 840

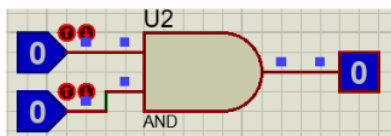
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Task

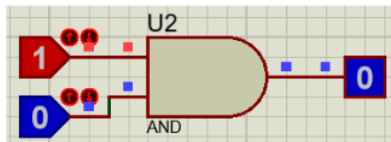
Question #01

A) And gate

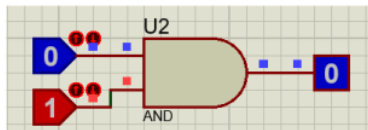
Inputs		Output
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1



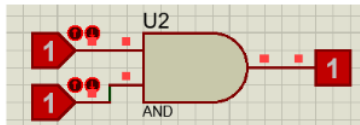
when A=0, B=0



when A=1, B=0



when A=0, B=1

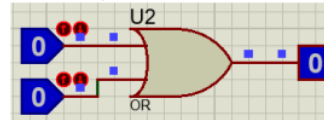


when A=1, B=1

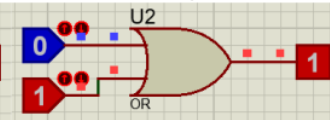
b) OR gate

Inputs		Output
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

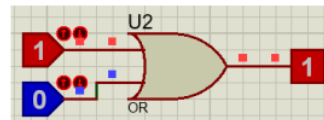
when A=0, B=0



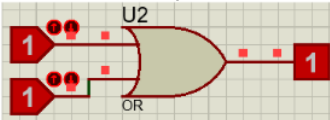
when A=0, B=1



when A=1, B=0



when A=1, B=1



5

6

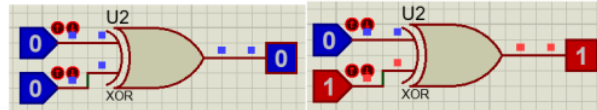
Task

c) XOR gate

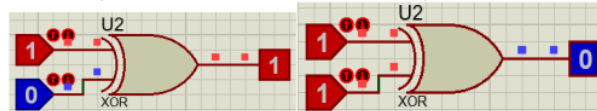
when A=0, B=0

Inputs		Output
A	B	$Y=A+B$
0	0	0
0	1	1
1	0	1
1	1	0

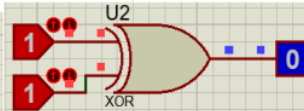
when A=0, B=1



when A=1, B=0



when A=1, B=1

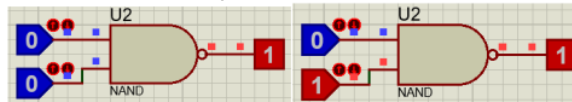


d) Nand gate

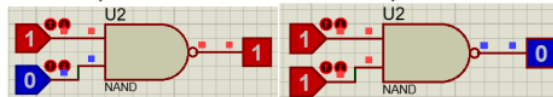
when A=0, B=0

Inputs		Output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

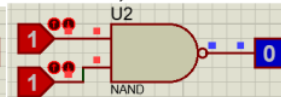
when A=0, B=1



when A=1, B=0



when A=1, B=1



e) Nor gate

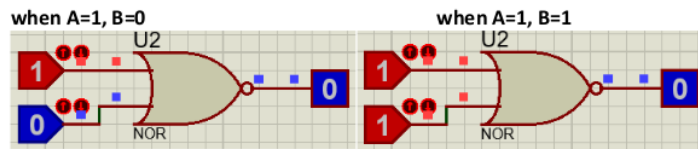
when A=0, B=0

Inputs		Output
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

when A=0, B=1



Task



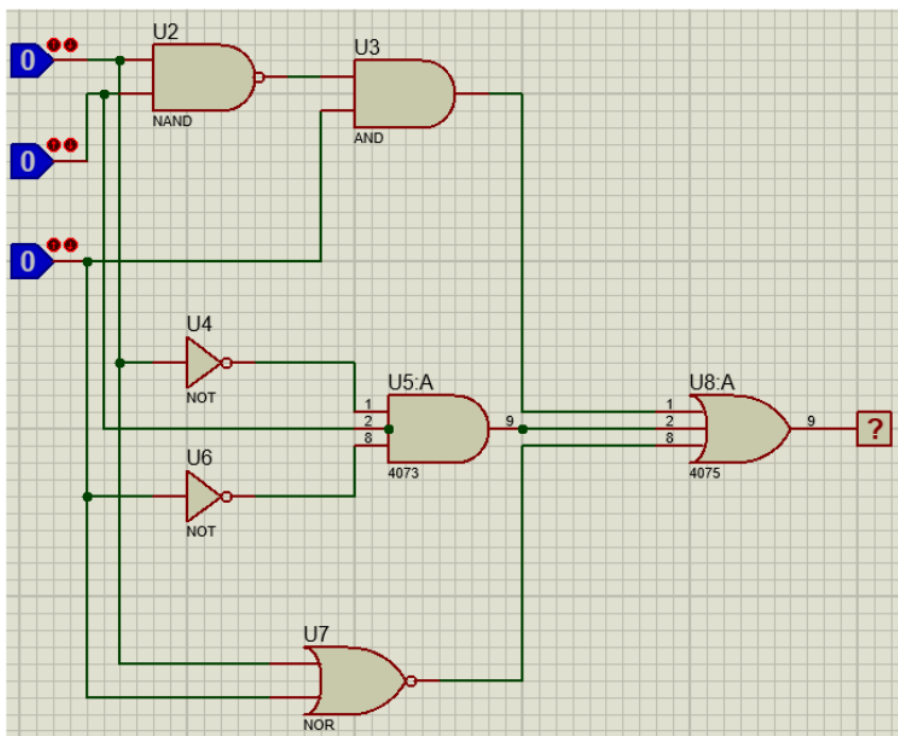
Question # 02



Design a logic circuit using a software for the following equations

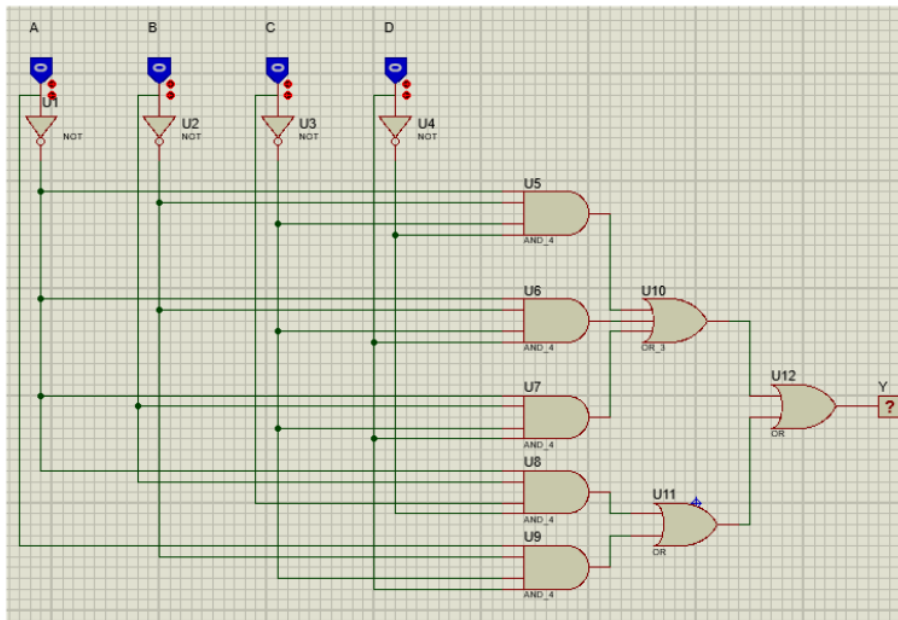
- $Y = (\overline{A}B)C + \overline{A}B\overline{C} + \overline{A} + C$
- $Y(A, B, C, D) = \sum_m(0, 1, 5, 6, 9)$

a) $\bar{Y} = (\overline{A}B)C + \overline{A}B\overline{C} + \overline{A} + C$

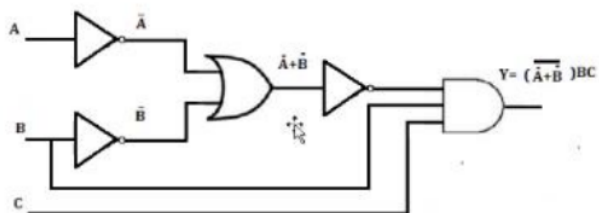


Task

b) $Y(A, B, C, D) = \sum_m(0, 1, 5, 6, 9)$



Question 03



boolean expression :

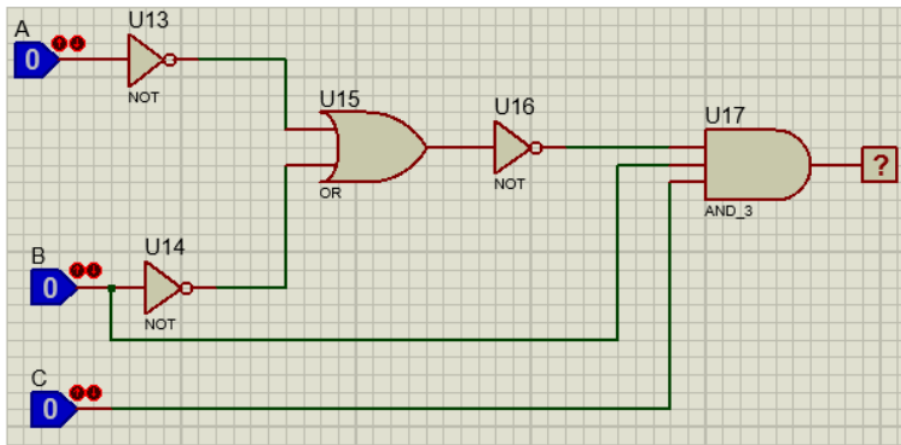
$$Y = (\overline{A} + \overline{B})BC$$

$$Y = (\overline{AB})BC$$

$$Y = ABBC$$

$$Y = ABC$$

Task



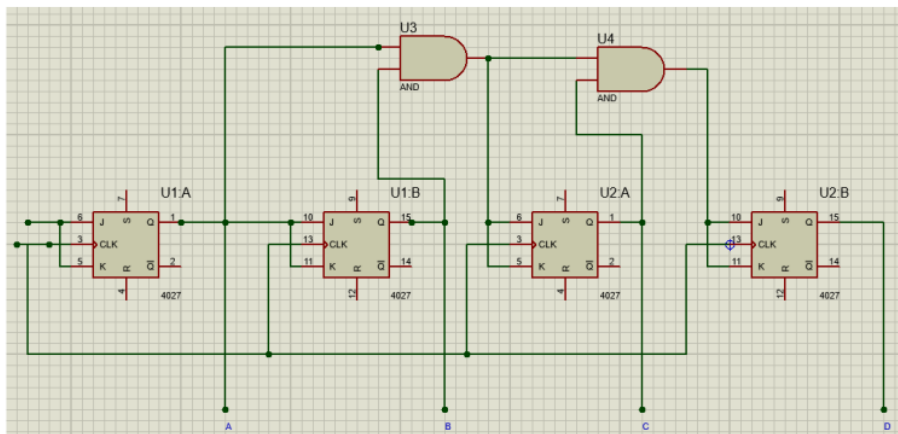
truth table

inputs			outputs
A	B	C	Y=ABC
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Question # 4



Task



Truth table

input		state	output			
clock	JK		D	C	B	A
1	1	0	0	0	0	0
2	1	1	0	0	0	1
3	1	2	0	0	1	0
4	1	3	0	0	1	1
5	1	4	0	1	0	0
6	1	5	0	1	0	1
7	1	6	0	1	1	0
8	1	7	0	1	1	1
9	1	8	1	0	0	0
10	1	9	1	0	0	1
11	1	10	1	0	1	0
12	1	11	1	0	1	1
13	1	12	1	1	0	0
14	1	13	1	1	0	1
15	1	14	1	1	1	0
16	1	15	1	1	1	1
17	1	0	0	0	0	0

Question #5

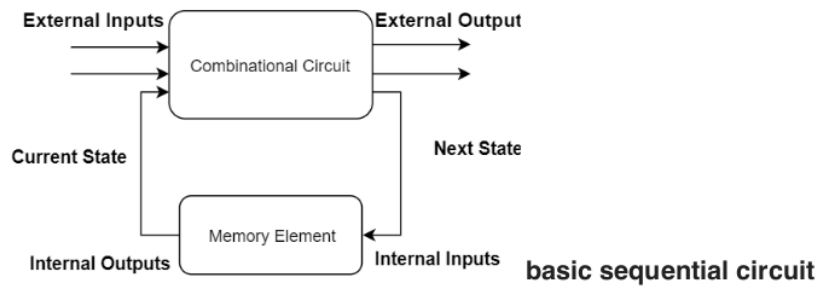
What is a Sequential Circuit?



Task

A sequential circuit is the assimilation of a **combinational logic circuit** and a storage element. With the applied inputs to the combinational logic, the circuit outputs are derived. These sequential circuits deliver the output based on both the current and previously stored input variables. The derived output is passed on to the next clock cycle. Sequential circuits consist of memory devices to store binary data. This binary information describes the current state of the sequential circuit. As sequential circuits work along with the combinational circuit, there are two types of combinational logic inputs which are:

- External inputs where these are not monitored by the circuit
- Internal inputs are the function of previous state output



As every digital and memory circuit is built based on the finite state machines, sequential circuits are implemented for the construction of these machines. So, these circuits hold more prominence in digital and **electronics** technology.

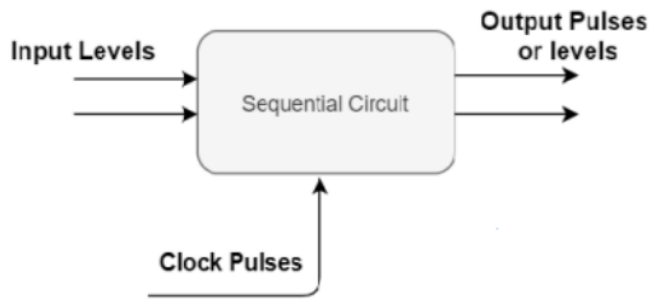
Types of Sequential Circuits

1. Synchronous Sequential Circuits
2. Asynchronous Sequential Circuits

1). Synchronous Sequential Circuits

Synchronous sequential circuits use level inputs and clock signals as the circuit inputs, having limitations on the circuit propagation time and pulse width to generate the output. The duration of the output pulse is like the clock pulse of the clocked circuit. The level output modified its state at the beginning of an input pulse and continues in that order until the next clock pulse arrives. Until the arrival of the next pulse, these circuits perform no activity and so the operation is a bit slower than that of asynchronous circuits.

Task

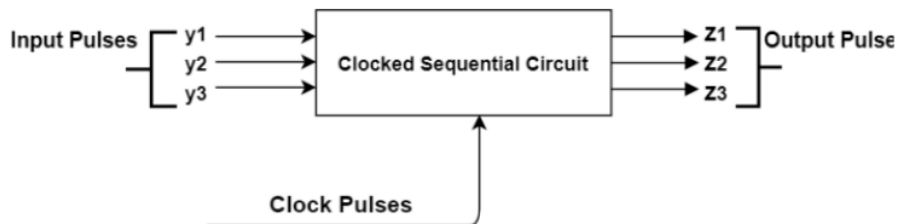


synchronous sequential circuit

Again, synchronous circuits are of two types clocked and unlocked.

a). Clocked Sequential Circuit

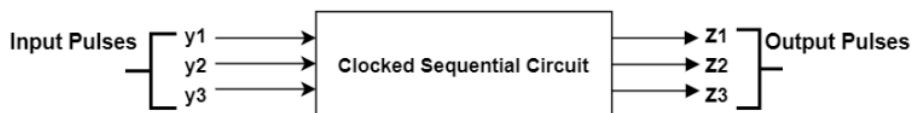
Clocked circuits use **flip-flops** and gated latches as the memory elements. The operation of the circuit is operated by the periodic clock pulses where these are connected to the clock inputs to synchronize all the internal modifications of the state.



clocked sequential circuit

b). Unclocked Sequential Circuit

These circuits do not require any clock. The internal changes of the state are based on the pulse transitions between 0-pulse or 1 -pulse. This is designed to act in response to the pulses of specific time; the periodic signals in between the null and spacer signals.



Unclocked sequential circuit

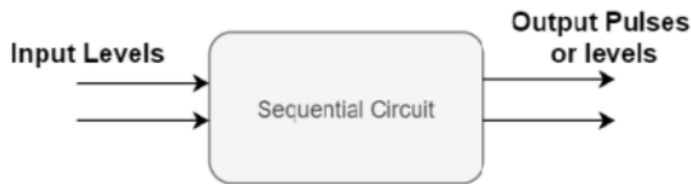
Applications

Task

Synchronous sequential circuits are implemented in the design of flip-flops, counters and to develop MOORE-MEALY state-controlled machines.

2). Asynchronous Sequential Circuits

Asynchronous sequential circuits performs their operation without depending on the clock signal but uses the input pulses and generates the output. As there is no clock pulse dependency, these circuits can switch to the next state quickly when the input signal is changed, So that there is a faster operation with asynchronous sequential circuits.



Asynchronous sequential circuit

Applications

Asynchronous sequential circuits are cost-effective to be used in small independent systems that need only a few elements. The communication between two elements, each hold its own independent clock, and this will be achieved by these circuits.

Digital Electronics Tasks Completed

GRADEMARK REPORT

FINAL GRADE

81 / 100

GENERAL COMMENTS

Instructor

Engagement with Literature Skills: Marks: 0/0

Knowledge and Understanding Skills: Marks: 22/25

It is evident through task 1 to 5, there is excellent knowledge and understanding of the basic underlying concepts and principles of the Digital Electronics Module.

Cognitive and Intellectual Skills: Marks: 18/25

Sound evaluation of the underlying concepts and principles is evident through the truth tables provided. However, it is better to have a brief evaluation report for each task, which is lagging in task 1 to 4.

Practical Application Skills: Marks : 38/45

A very good and appropriate application of basic methods and tools in Digital Electronics is evident. Logic circuits has been designed for set of tasks from 1 to 4. The screenshot of the outputs for various input combinations are provided for task 1 but not provided for task 2 and 3..

Transferable Skills for Life and Professional Practice: Marks : 3/5

The paper's overall structure adheres well to the assignment guidelines, ensuring a through exploration of the essential topics. Work is properly presented with a continuation in flow of information. Needs improvement in preparing the report, as it requires a title page, table of content, figure name, number and page numbers.



Comment 1

It is better to have a tittle page, the first page or the tile page of the report should have the name, student ID, Module Name, Module code, Title of the Coursework, programme of study.



Comment 2

Task 1: 18/20

Task 2: 23/30

Task 3: 15/20

Task 4: 17/20

Task 5: 8/10

Total: 81/100



Comment 3

It could have been better if table of content is added.



Comment 4

Good Work, Design of various logic gates for all the stages of the input and the truth table for each gate is good. It would have been better if a brief description is added.

Task 1: 18/20



Comment 5

It could have been better of the figures / screen grabs are named and numbered.



Comment 6

Include page number in all pages

PAGE 2

PAGE 3



Comment 7

Good Attempt, the design part is good. It is evident, that you can design circuits using software,. It is better to have outputs in the circuit screen sort and a brief description about the background of the design.

Task 2: 23/30



Comment 8

It is better to name and number the figure

PAGE 4



Comment 9

The simplified Boolean expression is correct. The truth table for the simplified circuit is correct. It would have been better if a brief description is added.

Task 3: 15/20

PAGE 5



Comment 10

The design of circuit diagram is good. The truth table is also correct. However, it is better to include few description

Task 4: 17/20

PAGE 6



Comment 11

Good Description, The different types of sequential circuits, and the applications of sequential circuits are mentioned. However, it is better to describe with necessary references.

Task 5: 8/10

PAGE 7

PAGE 8

PAGE 9



Comment 12

It is better is add reference