

CIRCUIT SIMULATON PROJECT

<https://esim.fossee.in/circuit-simulation-project>



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Project Guide: **Dr.N.SUBHASHINI**

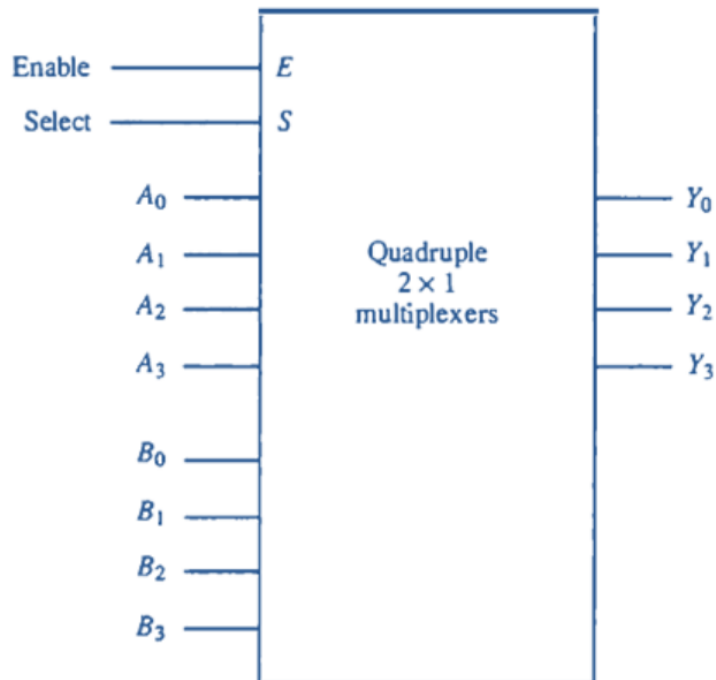
QUADRUPLE TWO TO ONE LINE MULTIPLEXER

THEORY:

- As in decoders, multiplexers may have an enabled input to control the operation of the unit. When the enable input is in the inactive state, the outputs are disabled, and when it is in the active state, the circuit functions as a normal multiplexer. The enable input is useful for expanding two or more multiplexers to a multiplexer with a larger number of inputs.
- In some cases, two or more multiplexers are enclosed within a single integrated circuit package. The selection and the enable inputs in multiple-unit construction are usually common to all multiplexers. As an illustration, the block diagram of a quadruple 2-to-1-line multiplexer is shown below:
- The circuit has four multiplexers, each capable of selecting one of two input lines. Output Y₀ can be selected to come from either input A₀ or B₀. Similarly, output Y_i may have the value of A_i or B_i, and so on. One input selection line S selects one of the lines in each of the four multiplexers. The enable input E must be active for normal operation.

- Although the circuit contains four multiplexers, we can also think of it as a circuit that selects one of two 4-bit data lines. As shown in the function table, the unit is enabled when $E = 1$. Then, if $S = 0$, the four A inputs have a path to the four outputs. On the other hand, if $S = 1$, the four B inputs are applied to the outputs. The outputs have all 0's when $E = 0$, regardless of the values of S.

Circuit:

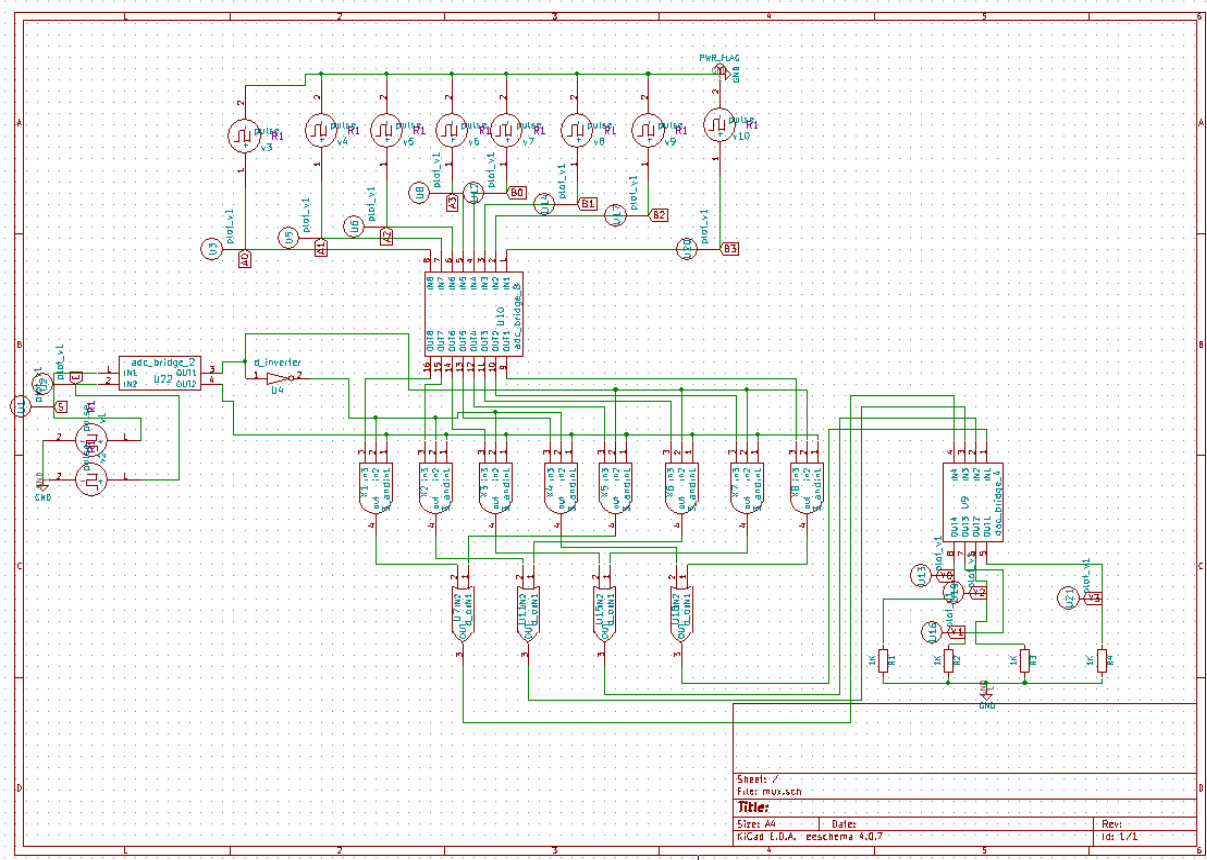


(a) Block diagram

| E | S | Y |
|-----|-----|---------|
| 0 | × | All 0's |
| 1 | 0 | A |
| 1 | 1 | B |

(b) Function table

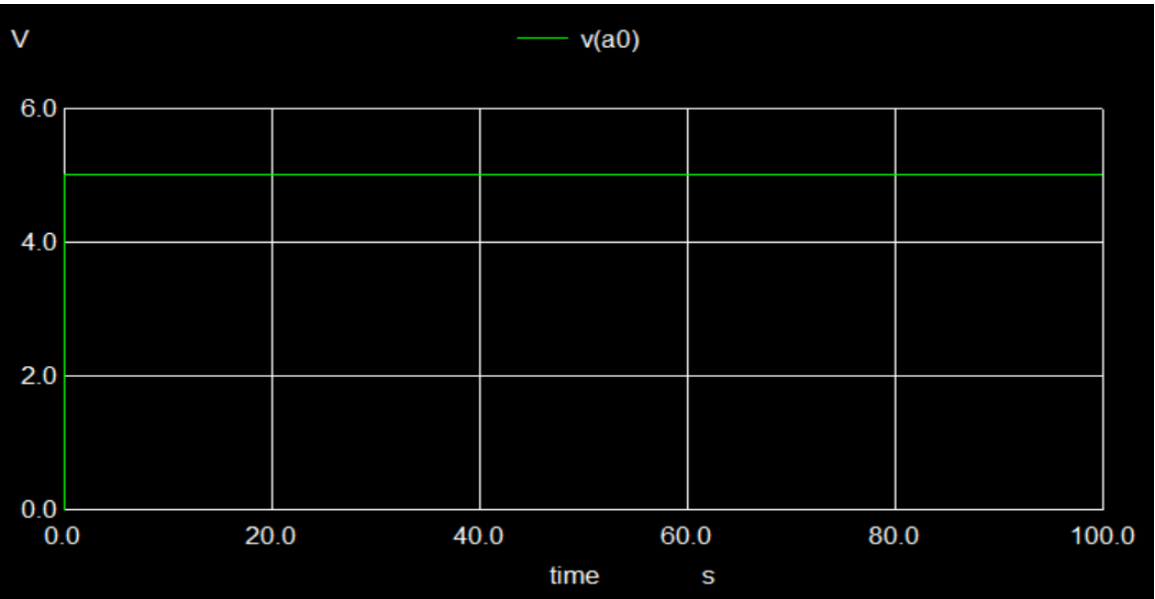
Circuit Implementation in Esim Software:



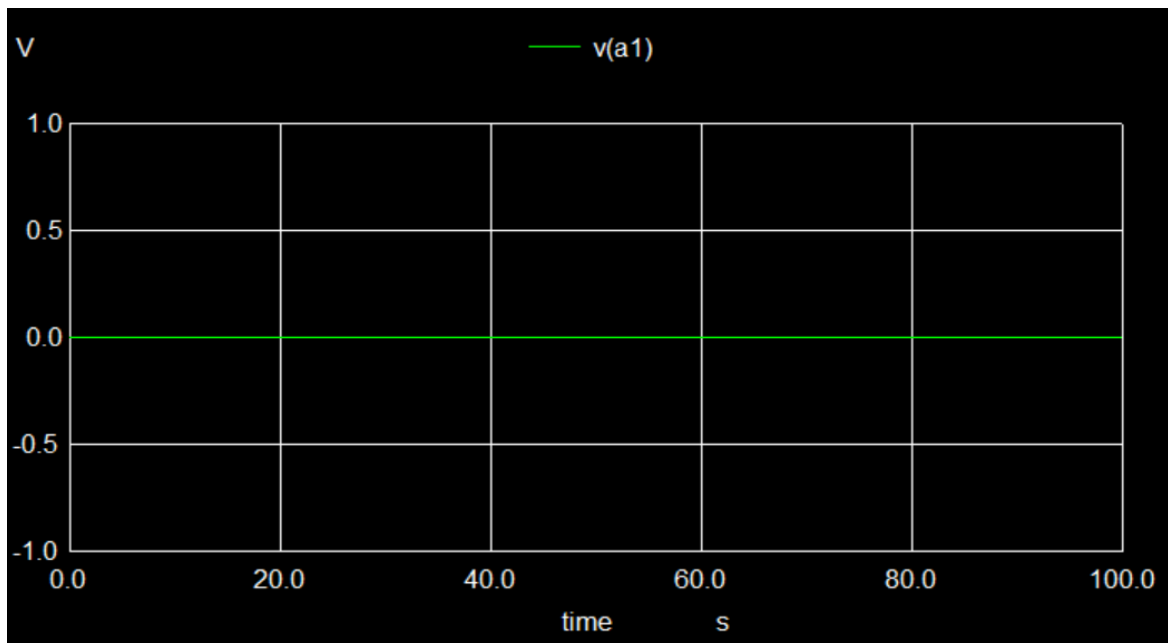
Plots:

NgSpice Plots:

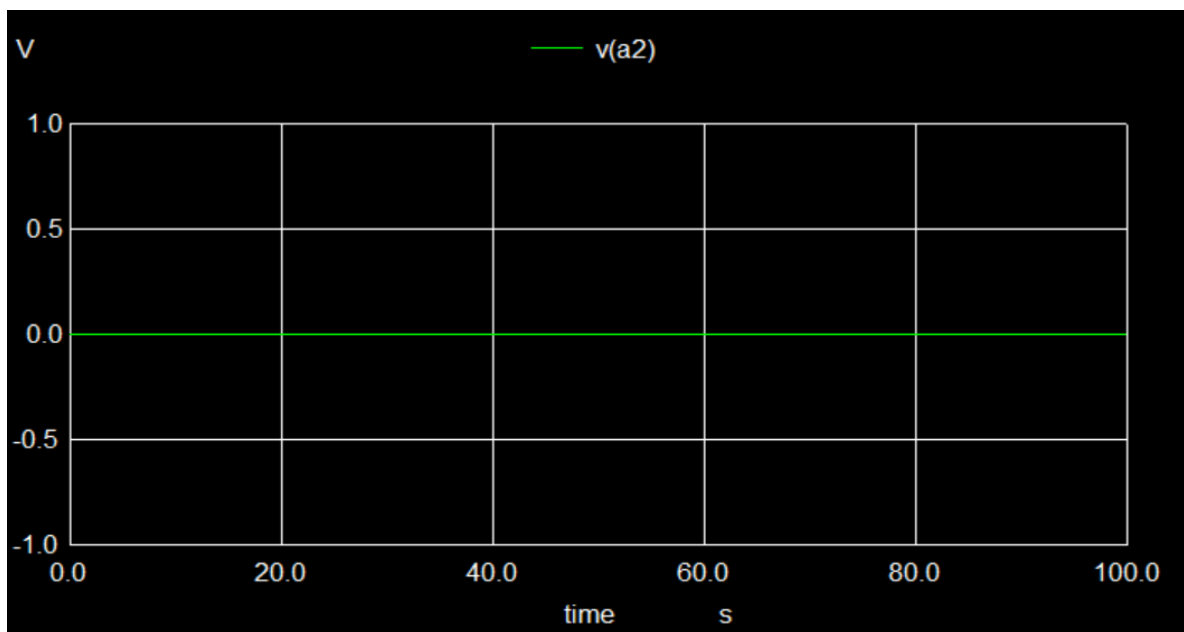
Input-A0:



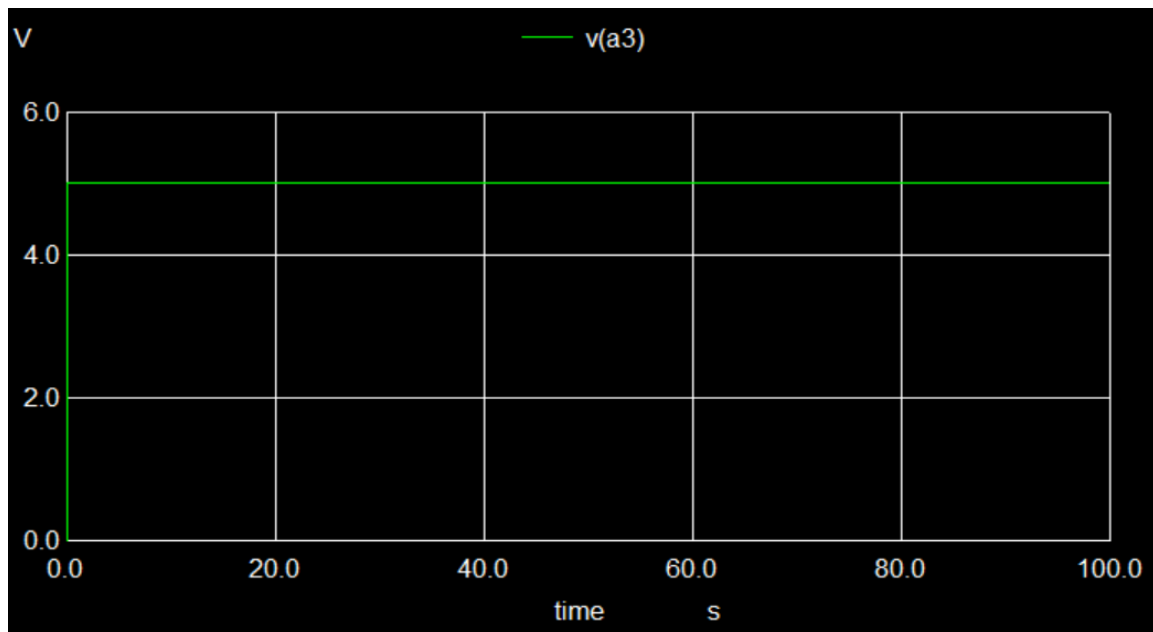
Input-A1:



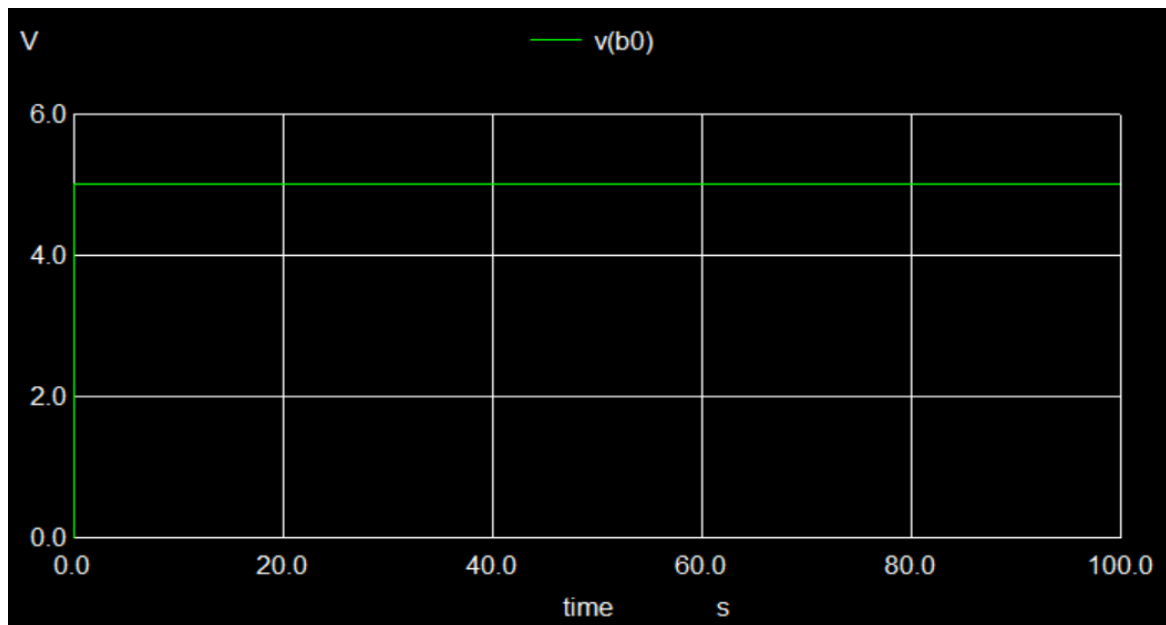
Input-A2:



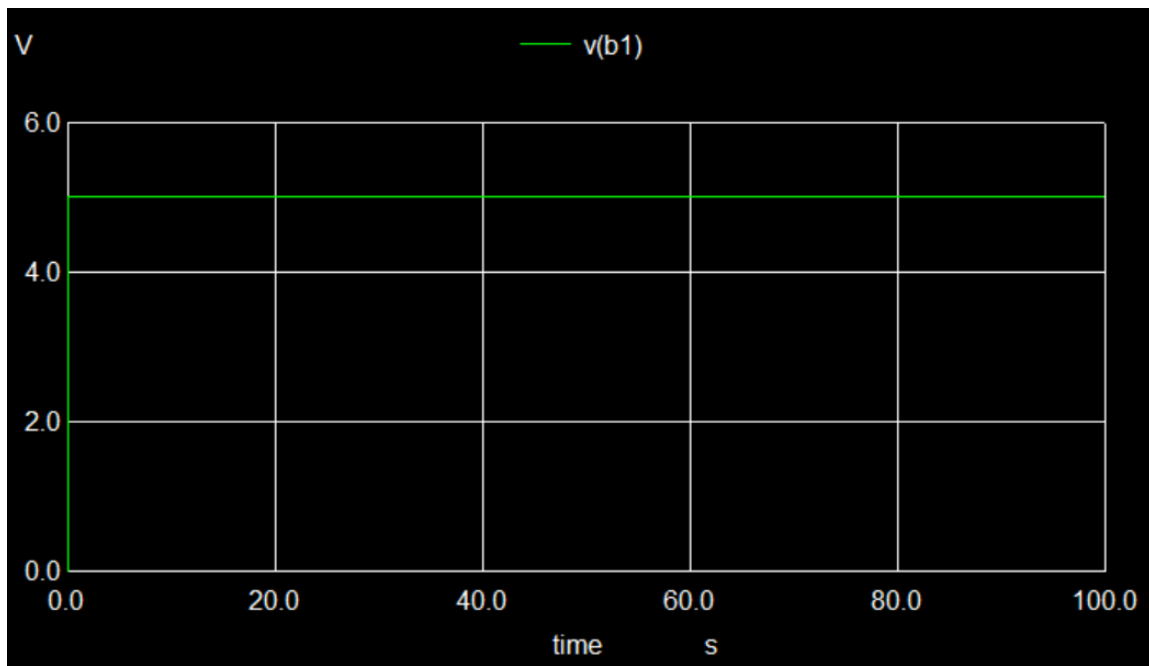
Input-A3:



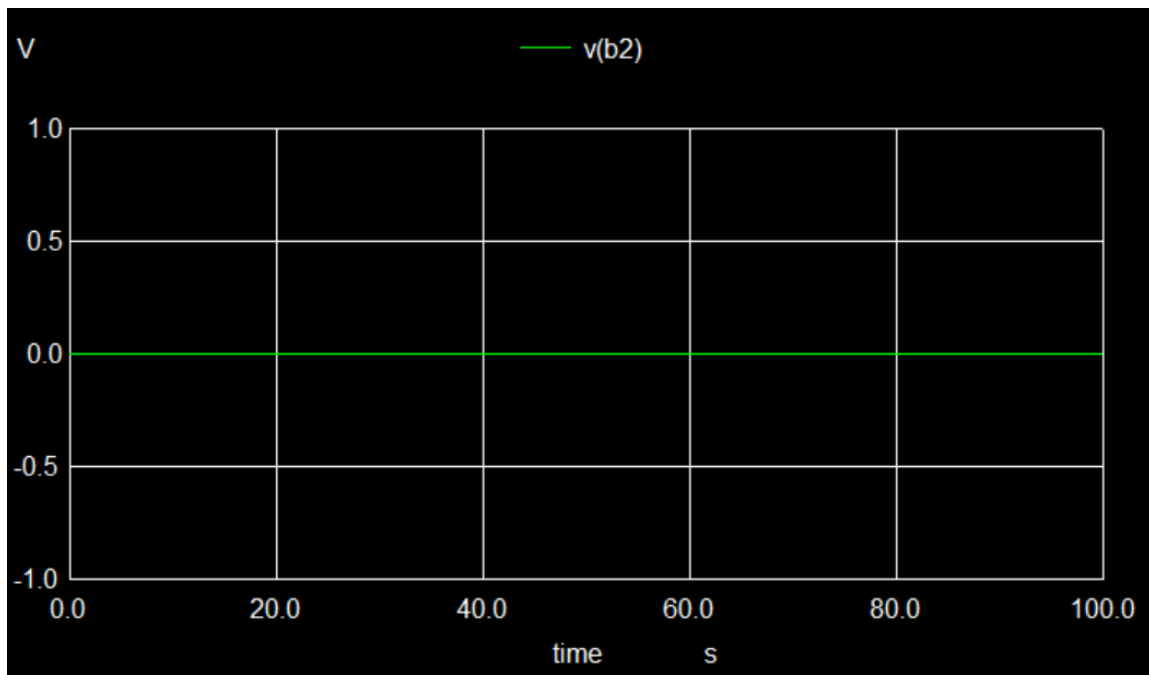
Input-B0:



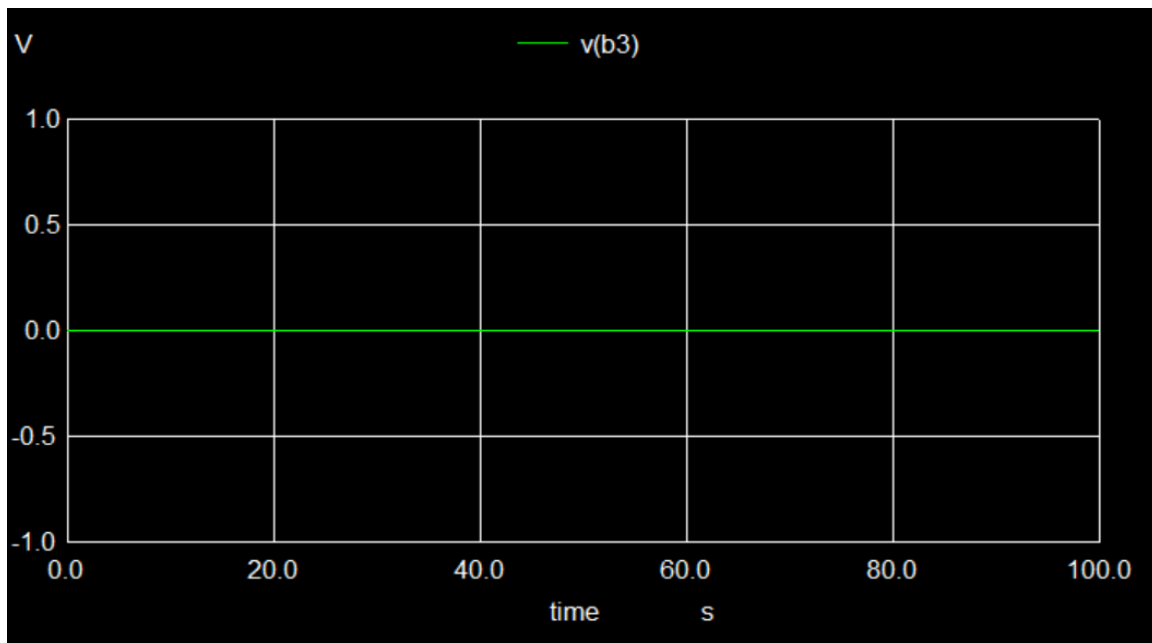
Input-B1:



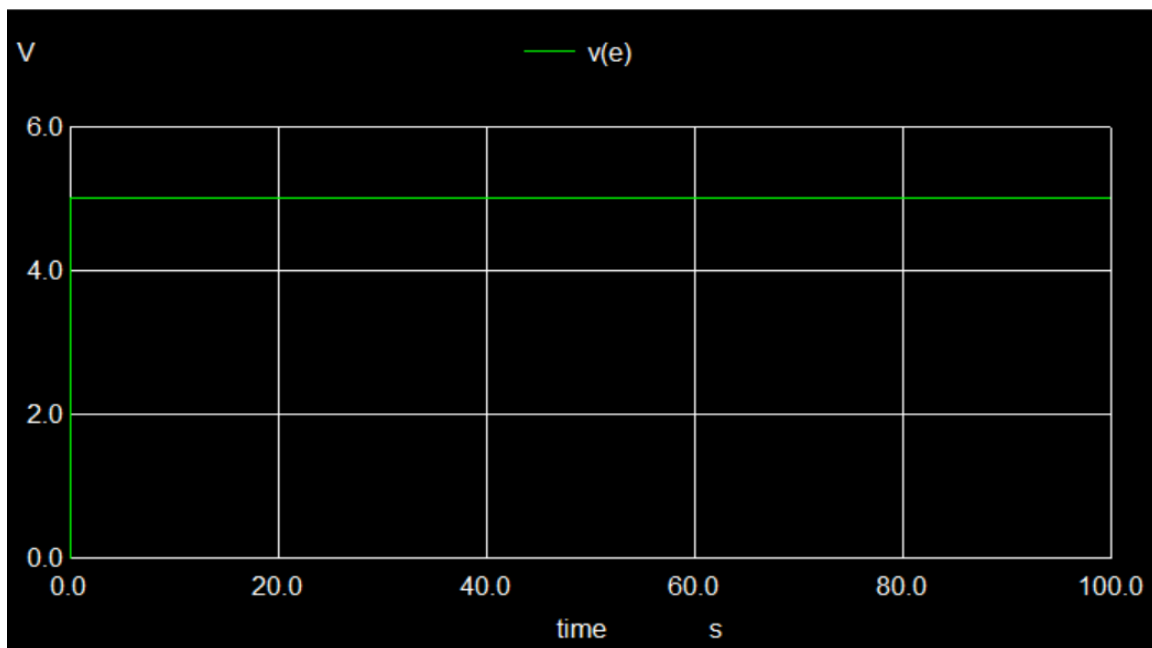
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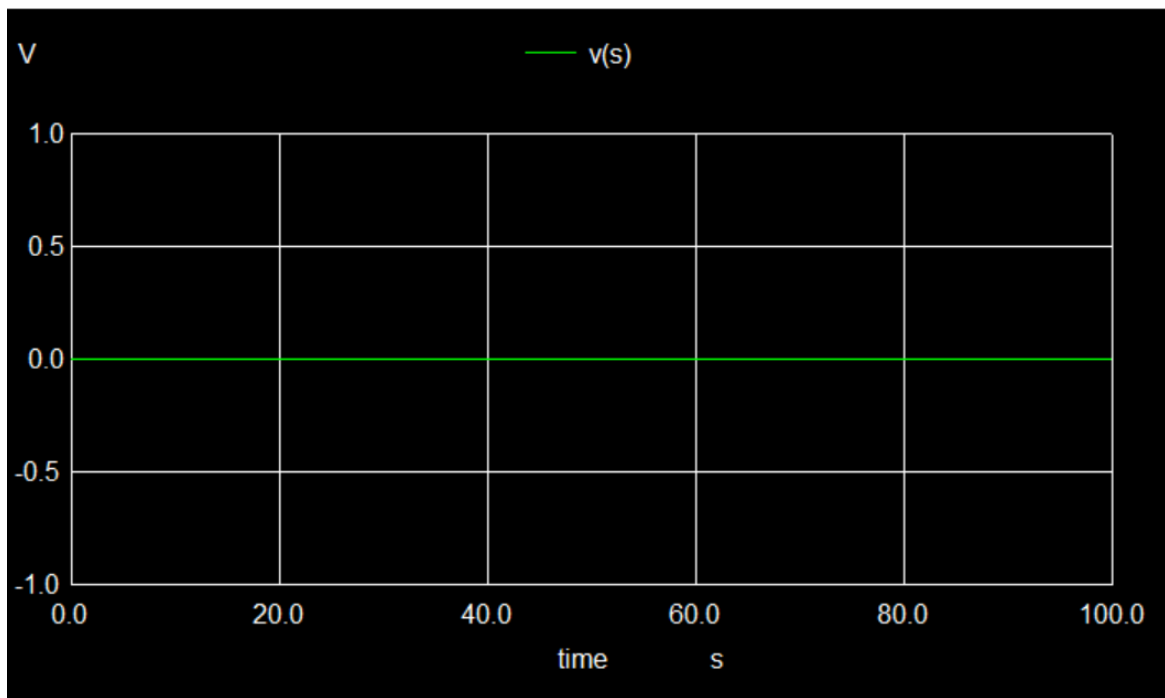
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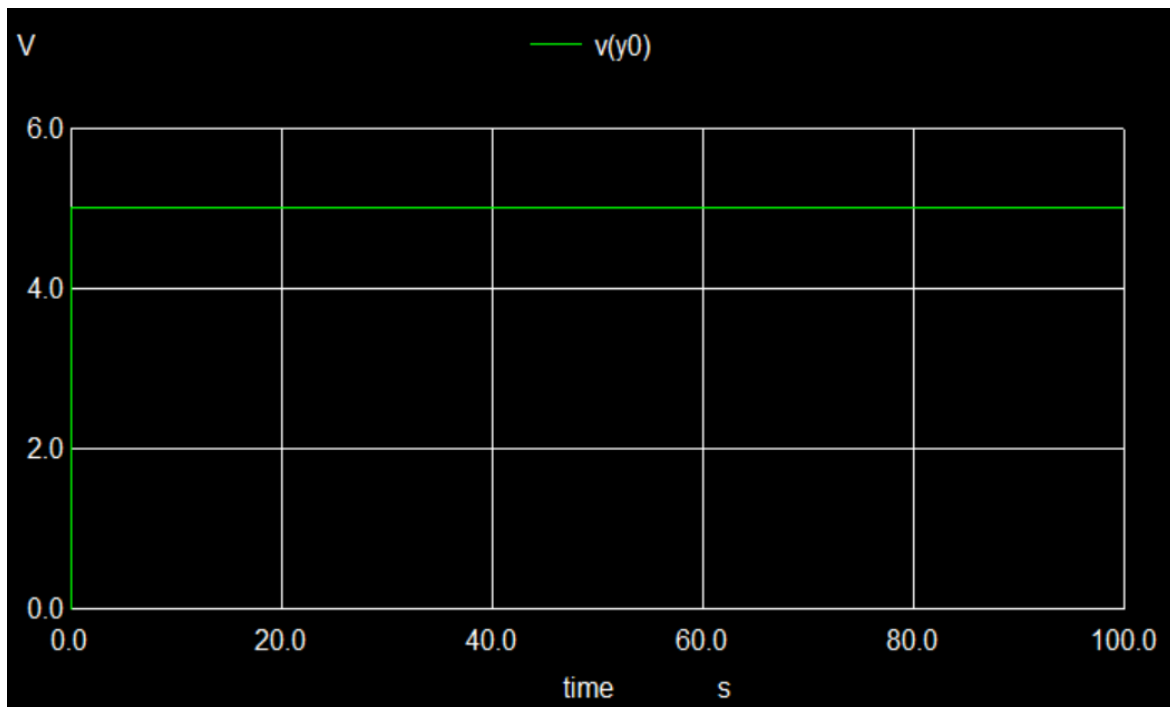
Input-Enable:



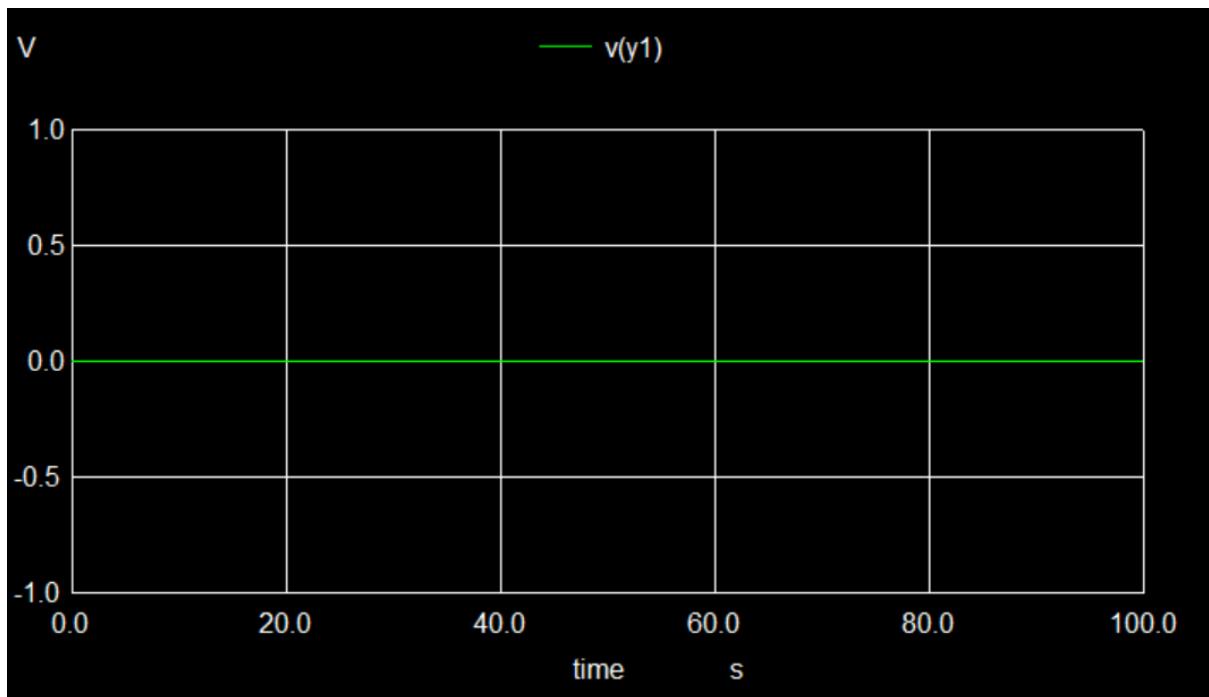
Input-Select:



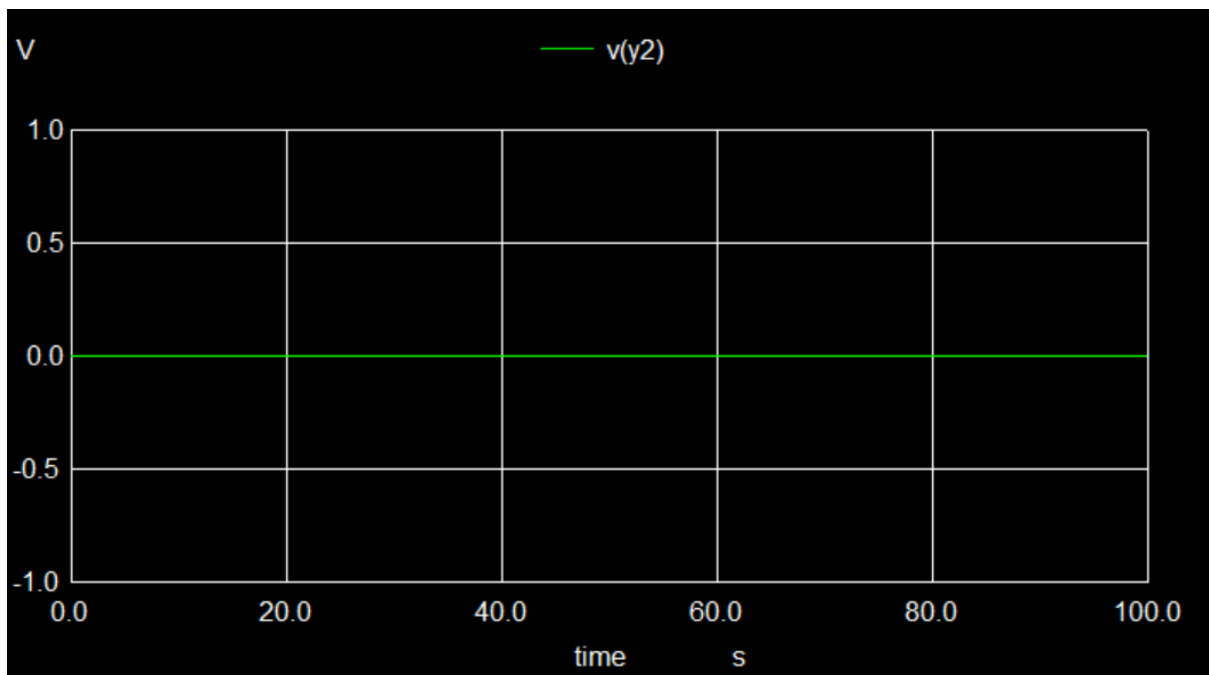
Output-y0:



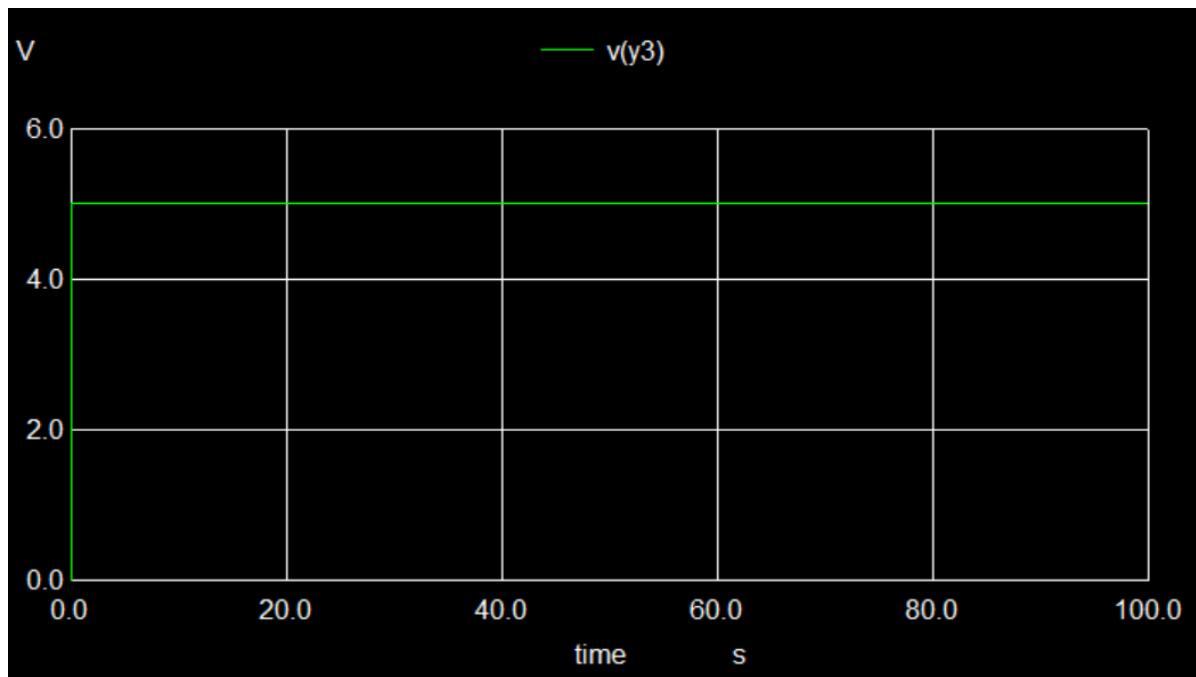
Output-y1:



Output-y2:

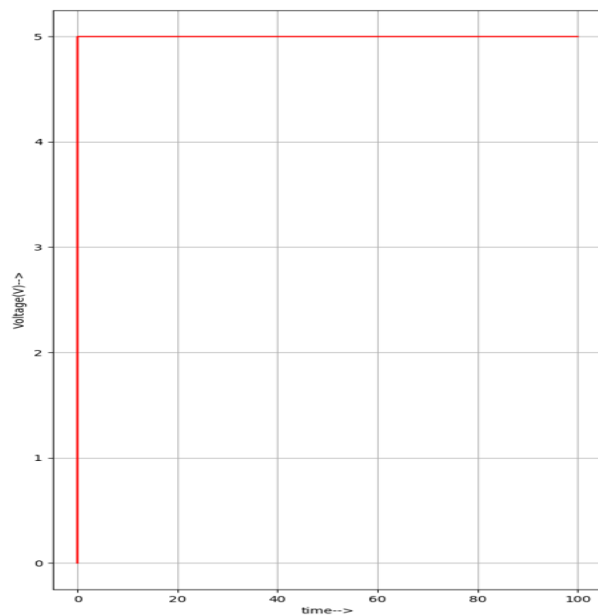


Output-y3:

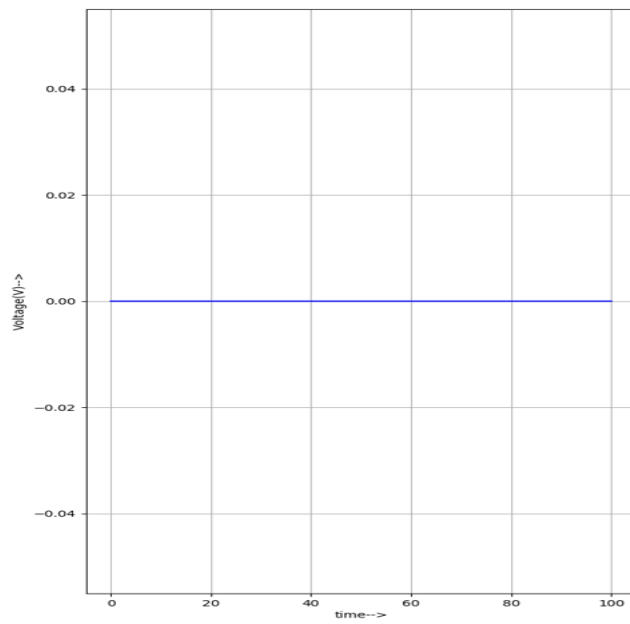


Python Plots:

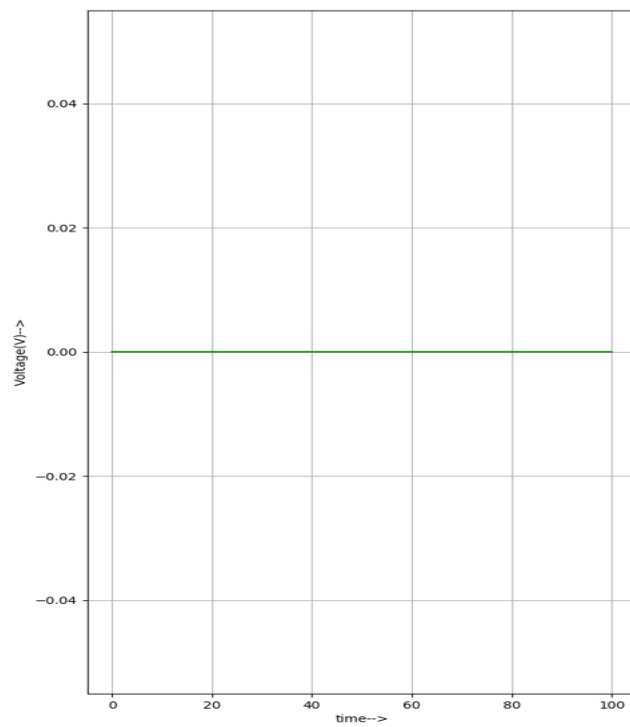
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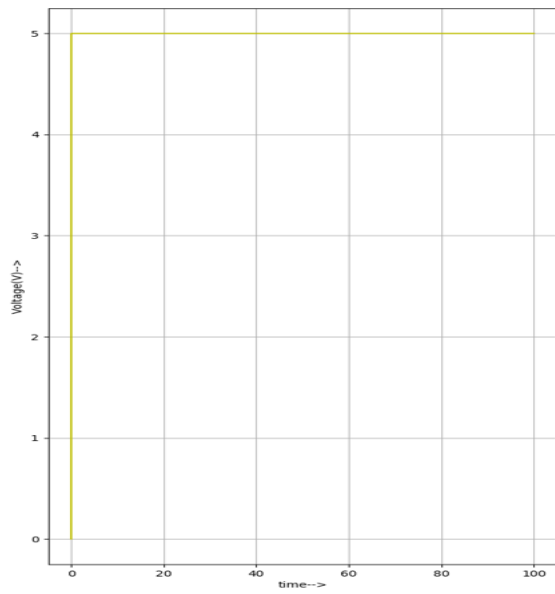
Input-A1:



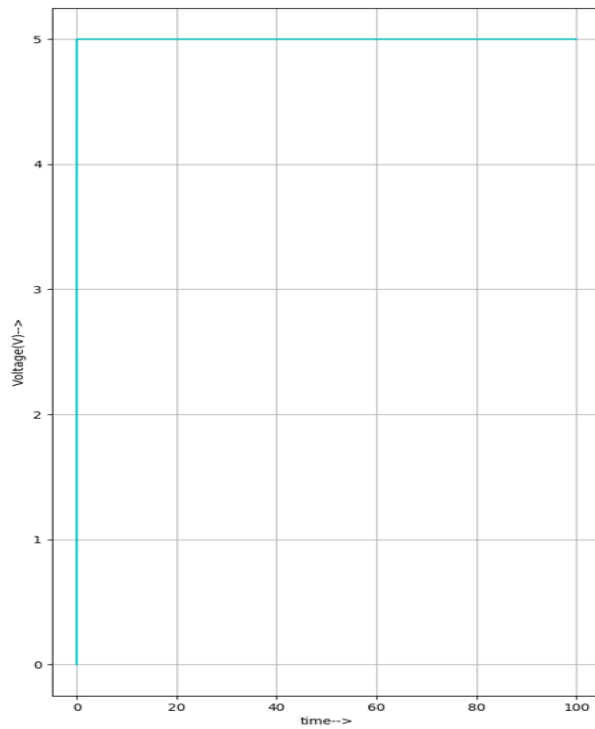
Input-A2:



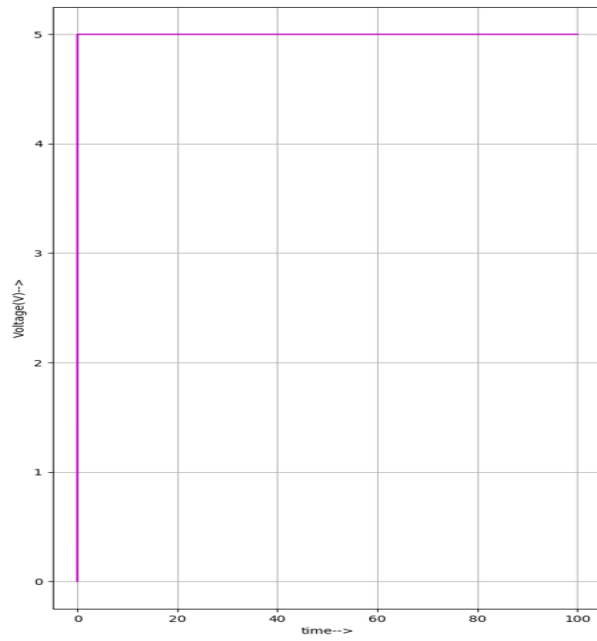
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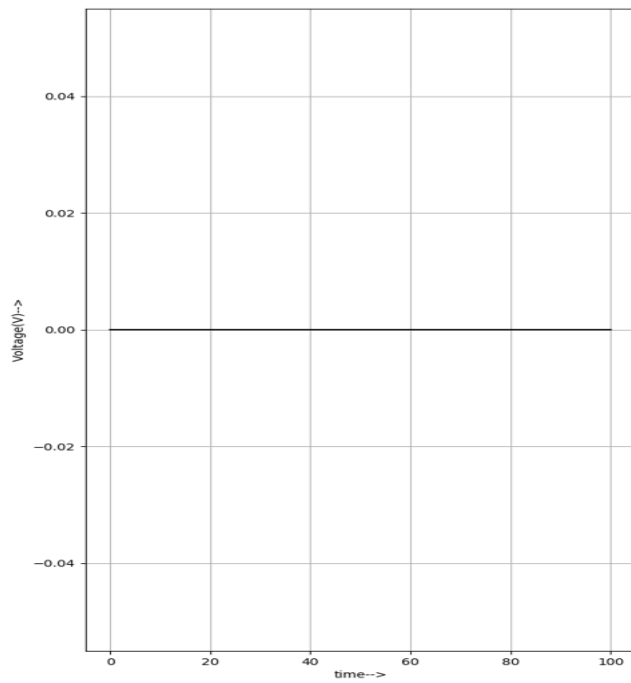
Input-B0:



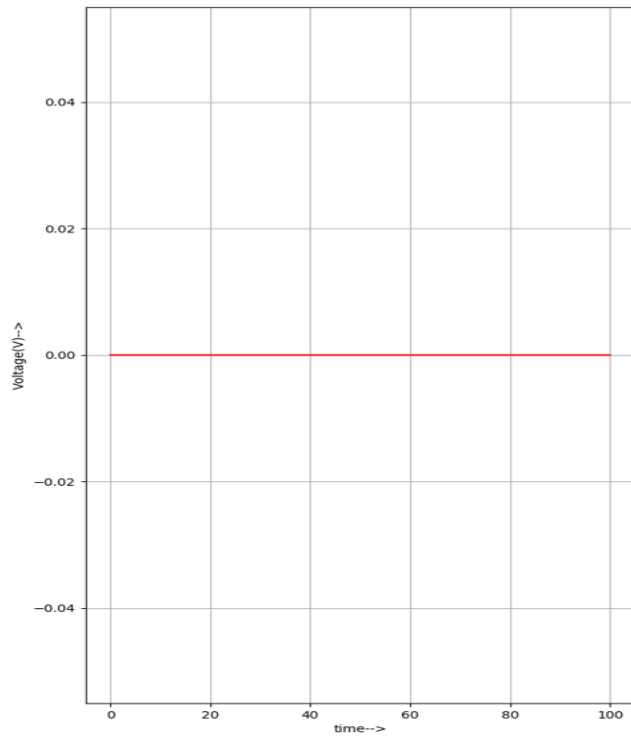
Input-B1:



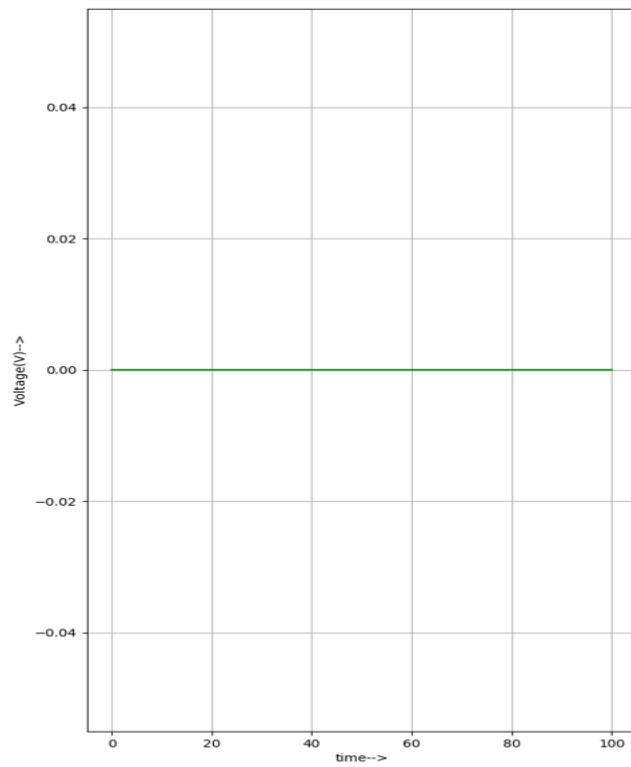
Input-B2:



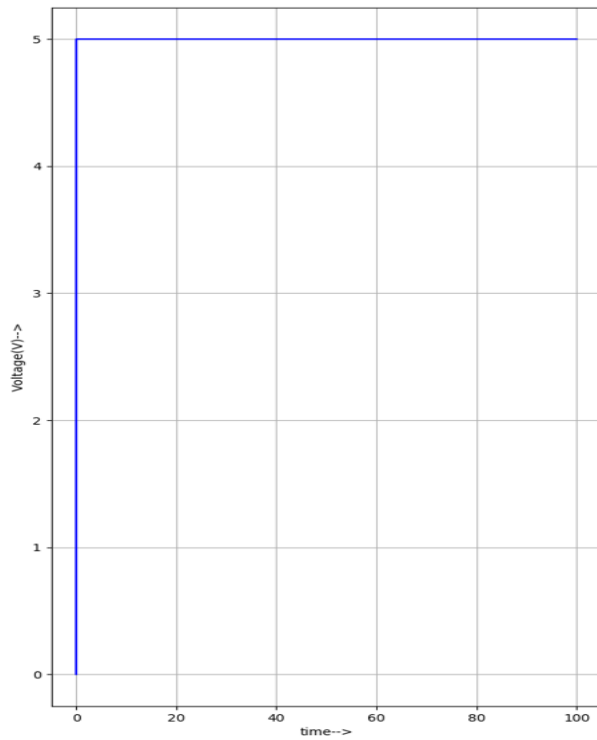
Input-B3:



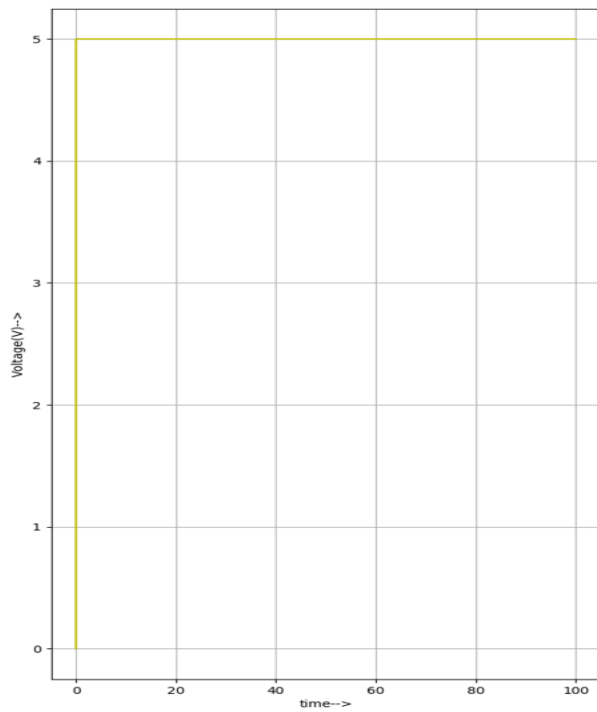
Input-Select:



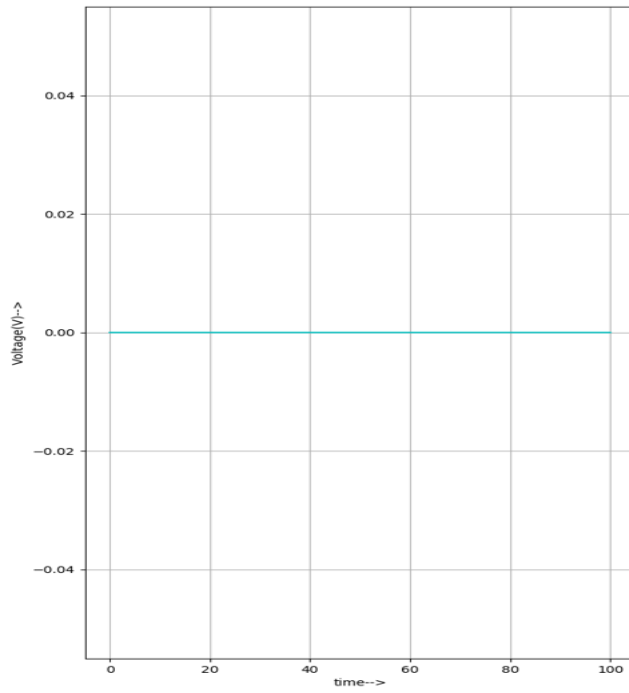
Input-Enable:



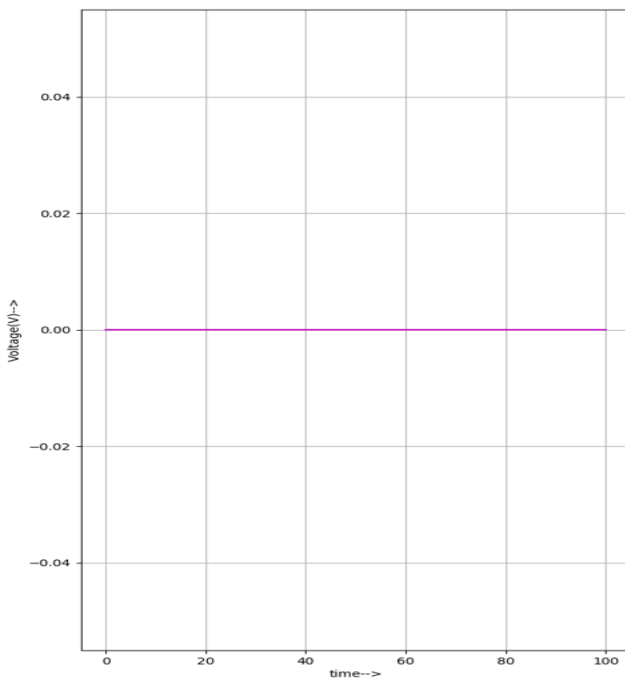
Output-Y0:



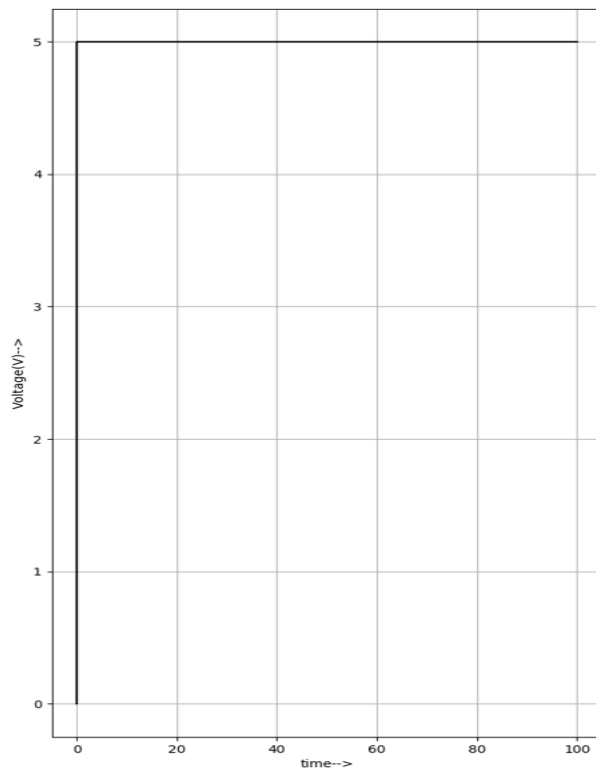
Output-Y1:



Output-Y2:



Output-Y3:



Sample I/O:

A-A₀A₁A₂A₃ = 1001

B-B₀B₁B₂B₃ = 1100

E-1

S-0

As select line input is given as 0 and the enable input is given as 1,

A is obtained as output in Y.

Y-Y₀Y₁Y₂Y₃ = 1001

References:

<https://webeduclick.com/quadruple-2-to-1-line-multiplexer>

https://www.ti.com/lit/ds/symlink/sn74lvc257a-q1.pdf?ts=1673836712136&ref_url=https%253A%252F%252Fwww.google.com%252F

https://www.tutorialspoint.com/digital_circuits/digital_circuits_multiplexers.htm