SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++'(III Cycle) Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

23ECB201 – DIGIT AL SYSTEMS DESIGN

II YEAR/ III SEMESTER

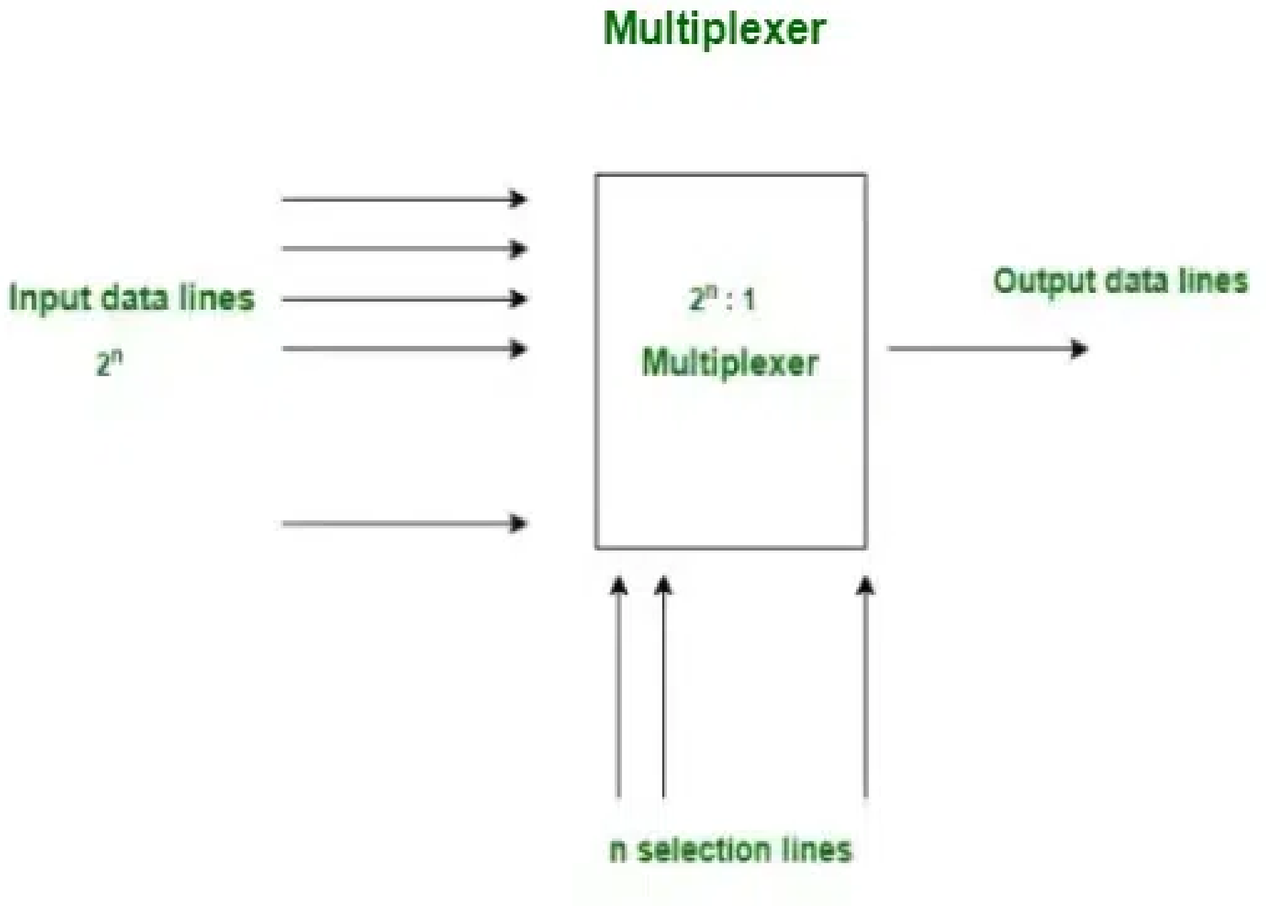
UNIT 2 – COMBINATIONAL CIRCUITS

TOPIC- MULTIPLEXER

MULTIPLEXER

- A multiplexer is a combinational circuit that has many data inputs and a single output, depending on control or select inputs.

- For N input lines, log2(N) selection lines are required, or equivalently, for 2^*n* input lines, n selection lines are needed.



TYPES OF MUX

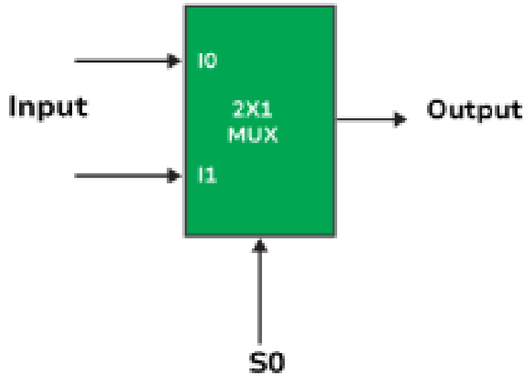
The Mux can be of different types based on input

- **2×1 Mux -** The 2×1 mux has two input lines, one output line, and a single selection line.

- **4×1 Mux -** It is a multiplexer that has 4 inputs and a single output. The Output is selected as one of the 4 inputs which is based on the selection inputs.

BLOCK DIAGRAM AND TRUTH TABLE

2:1 Multiplexer



Truth Table

S_0	I_0	I_1	Y
0	0	X	0
0	1	X	1
1	X	0	0
1	X	1	1

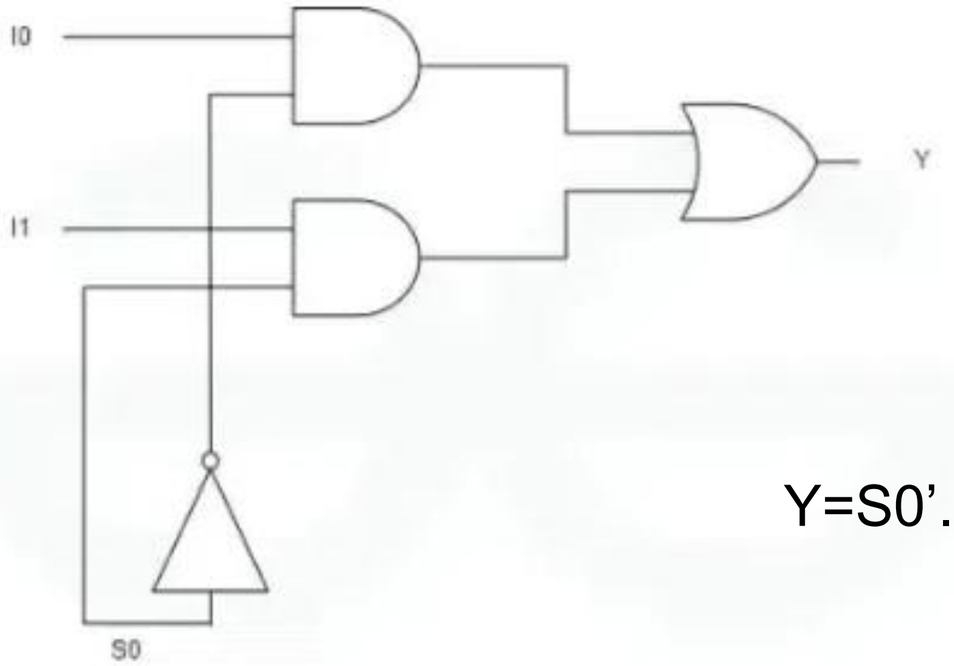
The output of the 2×1 Mux will depend on the selection line S0,

- When S is 0(low), the I0 is selected
- When S0 is 1(High), I1 is selected

Y=S0'.I0+S0.I1

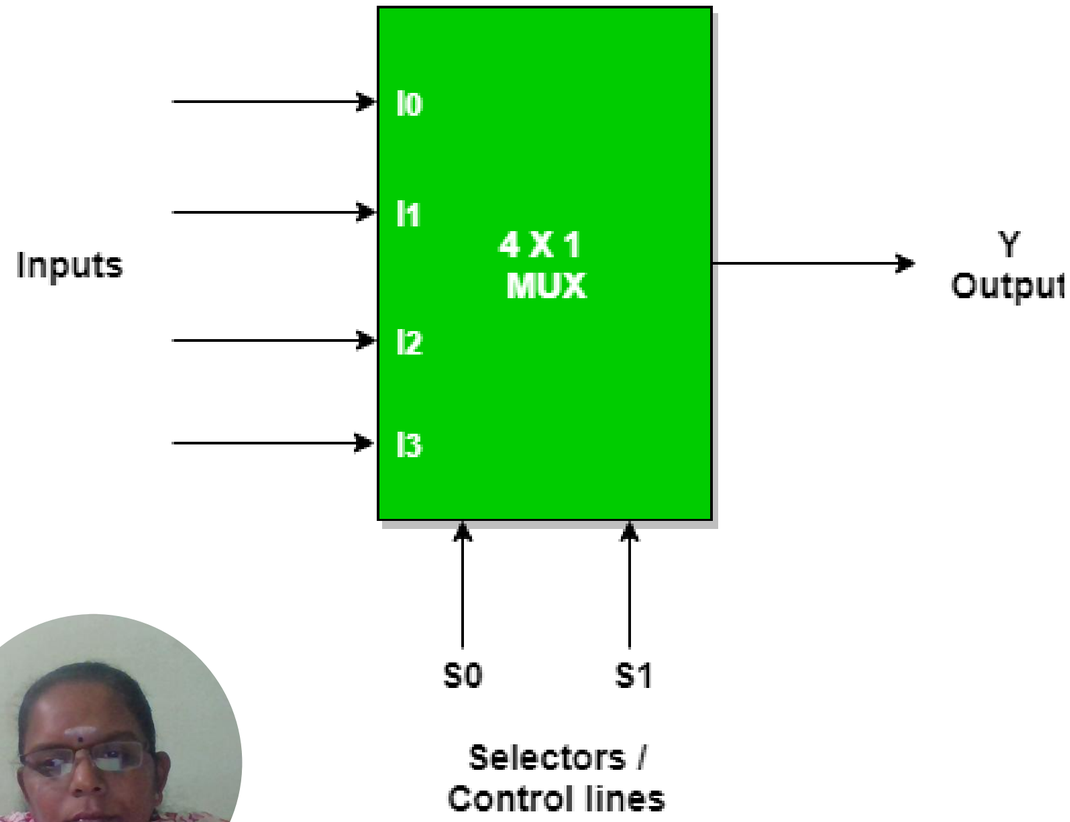
IMPLEMENTATION

Circuit Diagram of 2x1 Multiplexers



$$Y=S0'.I0+S0.I1$$

BLOCK DIAGRAM AND TRUTH TABLE



The output of the multiplexer is determined by the binary value of the selection lines

- When S1S0=00, the input I0 is selected.
- When S1S0=01, the input I1 is selected.
- When S1S0=10, the input I2 is selected.
- When S1S0=11, the input I3 is selected.

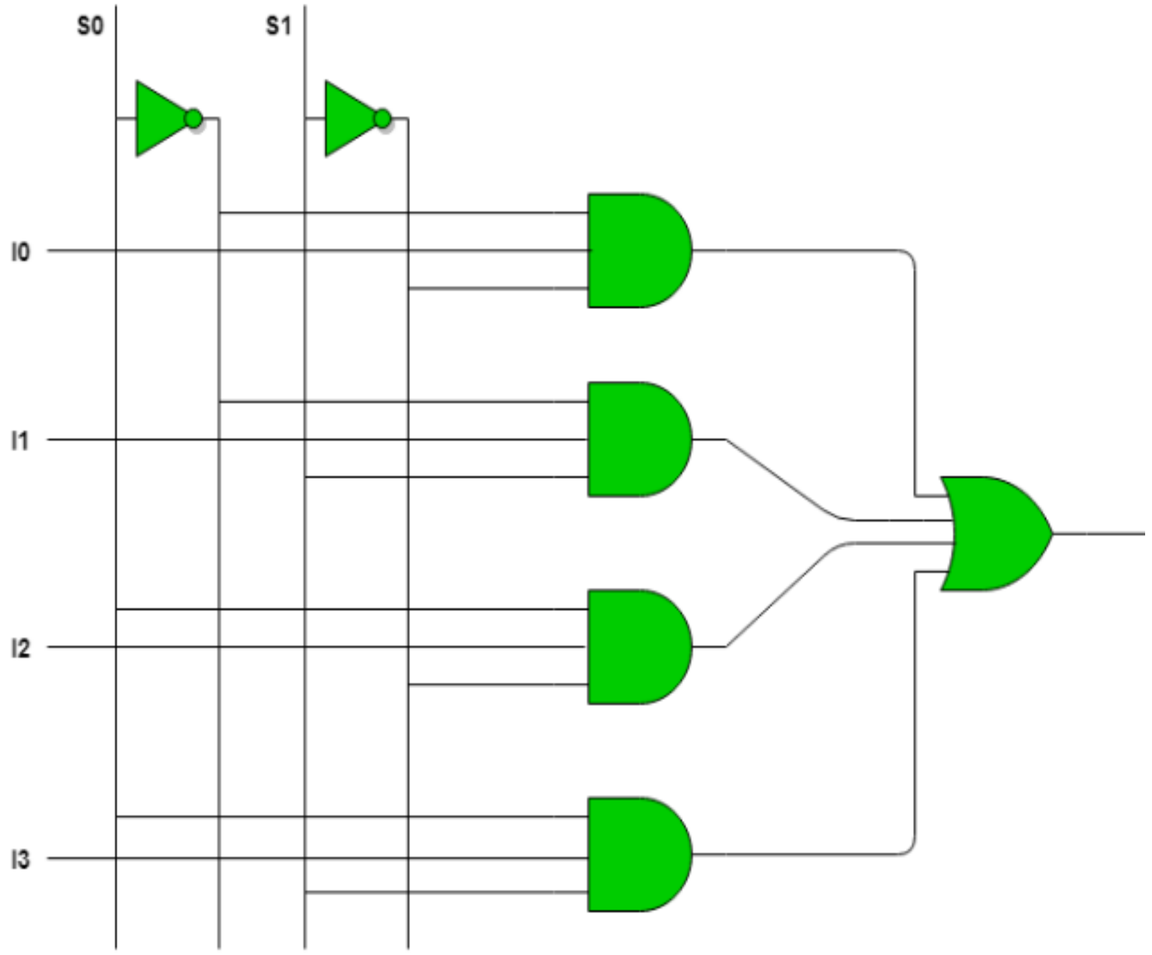
IMPLEMENTATION

Truth Table

S0	S1	Y
0	0	I0
0	1	I1
1	0	I2
1	1	I3

So, final equation,

$Y = S0'.S1'.I0 + S0'.S1.I1 + S0.S1'.I2 + S0.S1.I3$



APPLICATIONS OF MULTIPLEXER

1. Data Routing
2. Data Selection
3. Analog-to-Digital Conversion
4. Address Decoding
5. Logic Function Implementation

ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Efficiency
- Optimization
- Different Implementation
- Flexibility

DISADVANTAGES

- Limited number of data sources
- Delay
- Complex control rationale
- Power utilization

ASSESSMENT QUESTIONS

1. What is a multiplexer?
   a) It is a type of decoder which decodes several inputs and gives one output
   b) A multiplexer is a device which converts many signals into one
   c) It takes one input and results into many output
   d) It is a type of encoder which decodes several inputs and gives one output

2. Which combinational circuit is renowned for selecting a single input from multiple inputs & directing the binary information to output line?
   a) Data Selector
   b) Data distributor
   c) Both data selector and data distributor
   d) DeMultiplexer

THANK YOU