# AAA COLLEGE OF ENGINEERING AND TECHNOLOGY

Managed by Panjurajan – Amaravathy Trust and Promoted by Vinayaga- Sony Group of Industries
(Accredited by NAAC with an "A" grade) (An ISO TUV 21001: 2018 Certified Institution)
(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)
Amathur, Sivakasi - 626 005.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

# WORKSHOP ON

## *LT SPICE*

## *&*

## *Hackathons*

# TIPS AND TRICKS


- **Target : 2nd year students**
- **Goal: Greatly enhance the student's technical understanding and prepare them for success in both academic and competitive environments**

# WE the Priceless brains Team

# How do we work together ?

- TEAM FORMATION
- INTERVIEW PREPARATION MATERIALS
- IPR-NEEDS
- HACKATHON TIPS AND TRICK
- PROBLEM STATEMENT
- ICE BREAK SECTION
- LT SPICE INSTALLATION
- LT SPICE TUTORIAL
- LT SPICE TASKS
- IOT  ONLINE SIMULATION PROJECT
- WINNER TEAM WILL GET REWARD


OPPORTUNITY
OPPORTUNITY
EVERYWHERE
makeameme.org

# ECE Facts

## 88% Placement Record

**Over 88% of ECE graduates** from top-tier institutions like **IITs & NITs** are getting placed at leading tech companies and startups.

## ECE Industry Size and Growth (2023 to 2030)

- **2022** Global Market Size- **$2 trillion**
- **Global** growth expectation- **6-8% CAGR**
- **Indian** growth expectation- **9-10% CAGR**

## 2nd Largest Engg. Discipline

**1,500+** accredited ECE bachelor's degree programs are offered across India.

## Fastest Growing Segments

- **5G technology**
- **IoT**
- **AI**
- **Renewable Energy systems**

## Top Recruiters

- **Samsung**
- **Intel**
- **Qualcomm**
- **Cisco**
- **Reliance Jio**
- **Infosys**

## Average CTC

- Max. Salary- **INR 41.3 LPA**
- Min. Salary- **INR 5 LPA**


Interviews
Reference check
Feedback
Offer from Business Sweden
Welcome
Application
Invitation to analytical test
Online analytical test
Invitation to interview
THE RECRUITMENT PROCESS

# LEARN APTITUDE

Here my git hub link where you all can download the company-based questions

# INTERVIEW PREPARATION MATERIALS

- [All Company interview Questions](https://drive.google.com/drive/folders/1NC5wLHUMUye5_5zHzSgTgXDUdVmh43ZU)
- [Complete ACCENTURE Materials](https://drive.google.com/drive/folders/1oMtiEzBmKhDloSHmbujvB9LV0WtJ0VQq?usp=drive_link )
- [Complete TCS Materials](https://drive.google.com/drive/folders/1I8QqnzZonRewbSnUMyfC9-tRduEJ4gyB )
- [Complete ZOHO Materials](https://drive.google.com/drive/folders/1EtXkhhxviVc_orwQk78wAwav-cut63Yr )

# FORM A TEAM AND NAME THE TEAM

# Why **IPR-Intellectual Property Rights is** important to your project

Common people attached to the product easily

# Name the machine

Company name:**JCB**

Machine name: **Backhoe loaders**

# Name the machine

Company name: **Xerox**

Machine name:**photocopier machine**


TIGER
NEW
HABIT
TOILET CLEANER
Attacks limescale
Removes tough toilet stains
Deodourising fragrance
3 Action
Bright & Clean Shine
REMOVES
99%

Company name: **Habit**

Machine name:**bathroom cleaner**

# TOILET CLEANER BOTTLE ROYALTY

Office of the Controller General of Patents, Designs & Trade Marks
Department for Promotion of Industry and Internal Trade
Ministry of Commerce & Industry,
Government of India

(http://ipindia.nic.in/index.htm)

INTELLECTUAL PROPERTY INDIA (http://ipindia.nic.in/index.htm)

| Application Details | |
|---|---|
| APPLICATION NUMBER | 202441013025 |
| APPLICATION TYPE | ORDINARY APPLICATION |
| DATE OF FILING | 23/02/2024 |
| APPLICANT NAME | 1 . N.Thenmoezhi<br>2 . M.Sekar<br>3 . R. Suriyamoorthy<br>4 . R. Sivabalan<br>5 . A.M Janani<br>6 . V.Poonkodi<br>7 . Y.Dhanalakshmi<br>8 . S.Nitishkumar<br>9 . K.Nandhanaa |
| TITLE OF INVENTION | SYNTHETIC MEDICAL IMAGE SEGMENTATION AND EDGE DETECTION USING IMAGE PROCESSING TECHNIQUE |
| FIELD OF INVENTION | COMPUTER SCIENCE |
| E-MAIL (As Per Record) | |
| ADDITIONAL-EMAIL (As Per Record) | thenmoezhi@aaacet.ac.in |
| E-MAIL (UPDATED Online) | |
| PRIORITY DATE | |
| REQUEST FOR EXAMINATION DATE | -- |
| PUBLICATION DATE (U/S 11A) | 08/03/2024 |

Application Status

| | | |
|---|---|---|
| Patents | : | The Patents Act, 1970 as amended in 1999, 2002 and 2005 |
| Design | : | The Designs Act, 2000 |
| Trade Mark | : | The Trade Marks Act, 1999 |
| Copyright | : | The Copyright Act, 1957 as amended in 1983, 1984 and 1992, 1994, 1999 |
| Layout Design of Integrated Circuits | : | The Semiconductor Integrated Circuits Layout Design Act, 2000 |
| Protection of Undisclosed Information | : | No exclusive legislation exists but the matter would be generally covered under the Contract Act, 1872 |
| Geographical Indications | : | The Geographical Indications of Goods (Registration and Protection) Act, 1999 |
| Plant Varieties | : | The Protection of Plant Variety and Farmers' Rights Act, 2001 |

**18. What is the cost of filing a patent application in India?**

Some important fees* are given below:-

| S.No. | Action | Limits, conditions and timelines | Official fees for e- filing in rupees | | Official fees for physical filing in rupees | |
|---|---|---|---|---|---|---|
| | | | Natural person(s) or Startup(s) or Small entit(y)/(ies) or educational institution(s) | Other(s), alone or with natural person(s) or Startup(s) or Small entit(y)/(ies) or educational institution(s) | Natural person(s) or Startup(s) or Small entit(y)/(ies) or educational institution(s) | Other(s), alone or with natural person(s) or Startup(s) or Small entit(y)/(ies) or educational institution(s) |
| 1. | Filing of Patent Application along with complete/ provisional specification | Up to 30 pages and Up to 10 claims | 1600 | 8000 | 1750 | 8800 |
| | | | 160 | 800 | 180 | 880 |
| | | For each additional claim | 320 | 1600 | 350 | 1750 |
| | | For each page of sequence listing of nucleotide or amino acid | 160 Subject to a maximum of 24000 | 800 subject to a maximum of 120000 | Not allowed | Not allowed |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. | Request for examination of patent | | 4000 | 20000 | 4400 | 22000 |
| | Request for expedited examination of application | | 8000 | 60000 | Not allowed | Not allowed |
| 3. | Request for early publication | | 2500 | 12500 | 2750 | 13750 |
| 4. | Renewal fee (every year) | 2nd to 6th year | 800 | 4000 | 880 | 4400 |
| | | 7th to 10th year | 2400 | 12000 | 2650 | 13200 |
| | | 11th to 15th year | 4800 | 24000 | 5300 | 26400 |
| | | 16th to 20th year | 8000 | 40000 | 8800 | 44000 |

*Note: Fees may be revised from time to time by Govt. of India

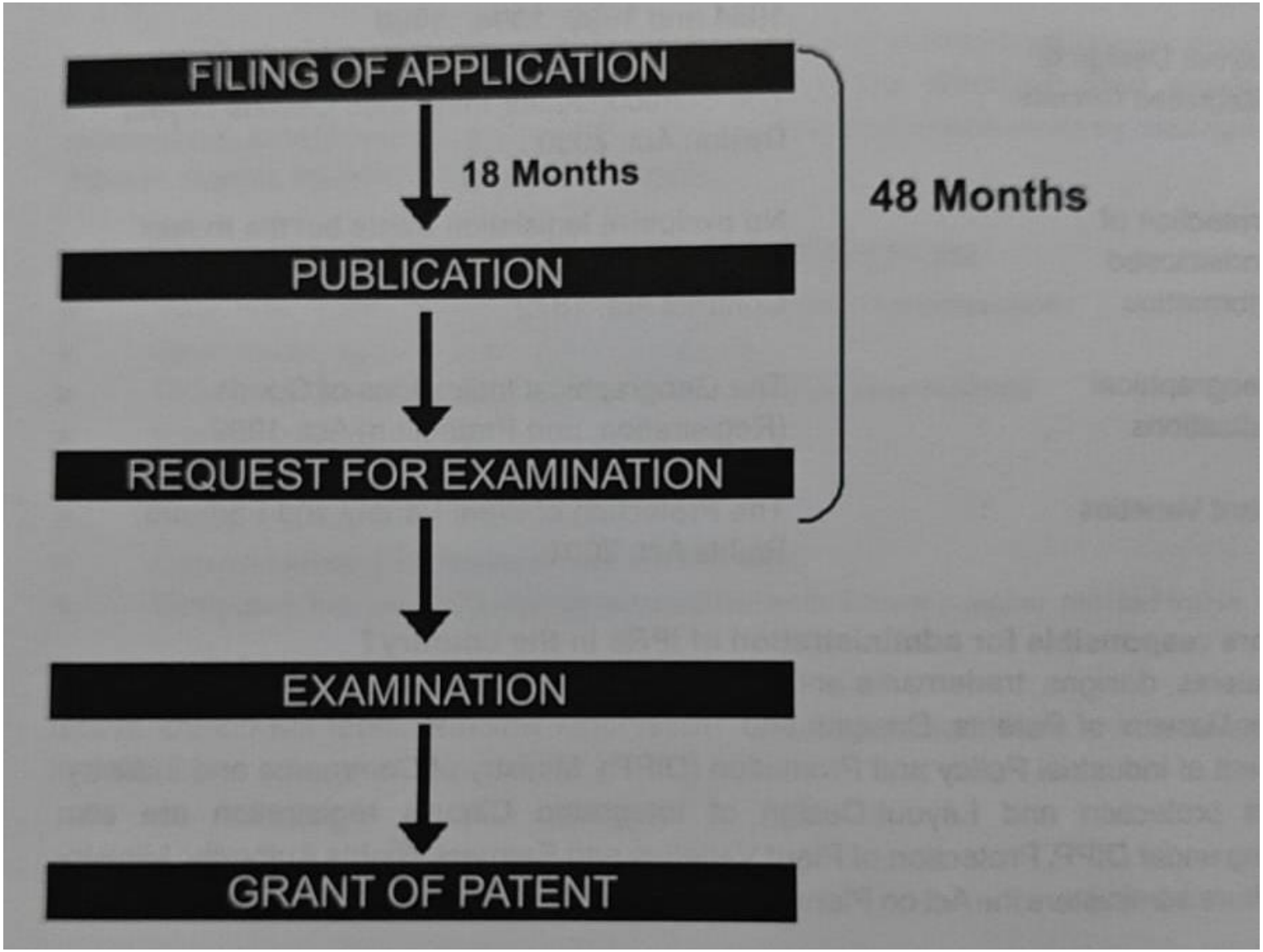
evaluation of a registered layout design shall not constitute any infringement.

**4. What is the cost of registering IC layout design application in India?**

Some important fees are given below:

| S. No. | Action | Official fees (in Rs.) |
|---|---|---|
| 1. | On application to register a layout - design | 5000/- |
| 2. | On request for certificate of the Registrar | 1000/- |

*Note: Fees may be revised from time to time by Govt. of India


FILING OF APPLICATION
18 Months
PUBLICATION
REQUEST FOR EXAMINATION
48 Months
EXAMINATION
GRANT OF PATENT

evaluation of a registered layout design shall not constitute any infringement.

**4. What is the cost of registering IC layout design application in India?**

Some important fees are given below:

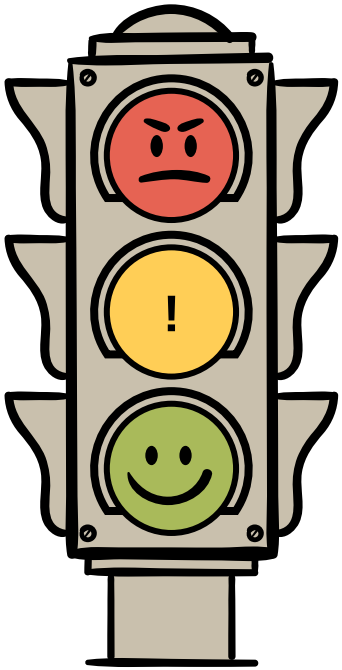
| S. No. | Action | Official fees (in Rs.) |
|---|---|---|
| 1. | On application to register a layout - design | 5000/- |
| 2. | On request for certificate of the Registrar | 1000/- |

*Note: Fees may be revised from time to time by Govt. of India

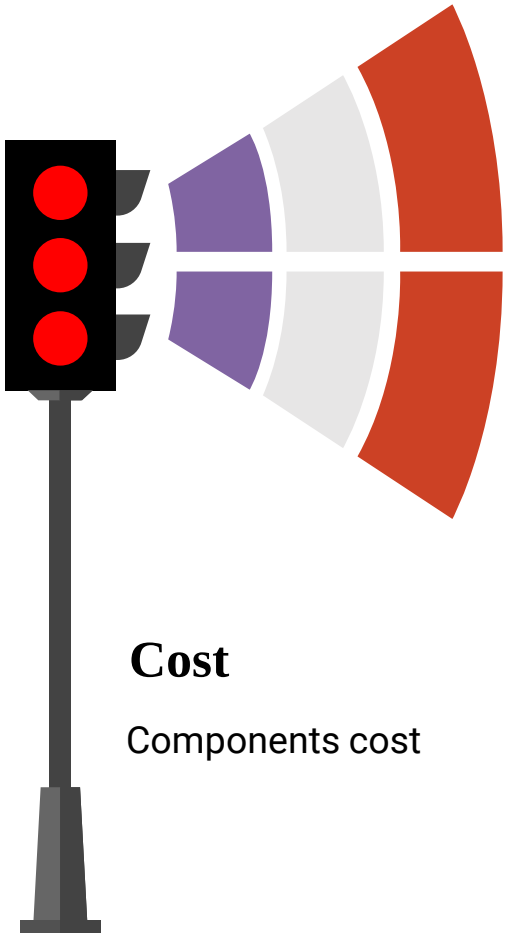
# ***Tricks to crack the hackathons***


- Content Delivery in PowerPoint slides and flow
- The demonstration Video and about the video
- Poster about the project
- In English presentation
- Use ChatGPT  but check plagiarism  for the content
- Working prototype

# CONTENTS

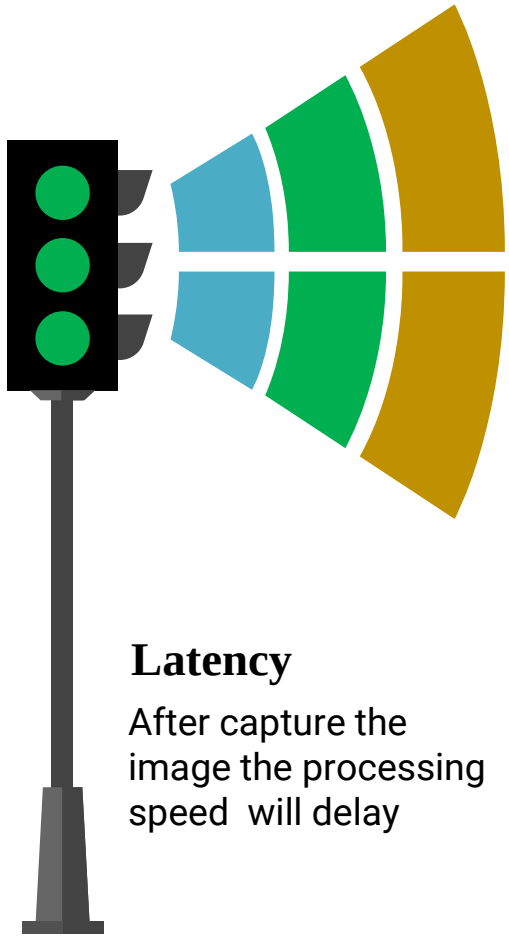


# CHALLENGES WE FACED



## Cost

Components cost



## Latency

After capture the image the processing speed  will delay

## Image Focusing

Due to in efficiency of camera auto focusing issed is faced

# Future Implementations

01

**Integration with Traffic Signal Control:**
•Optimize signals based on real-time road conditions for efficient traffic.

02

**Dynamic Road Sign Information Updates:**
•Ensure current road sign data through dynamic, real-time information updates.

03

**Collaborative Vehicle Communication:**
•Enhance safety by sharing real-time road information among equipped vehicles.

# Road Map

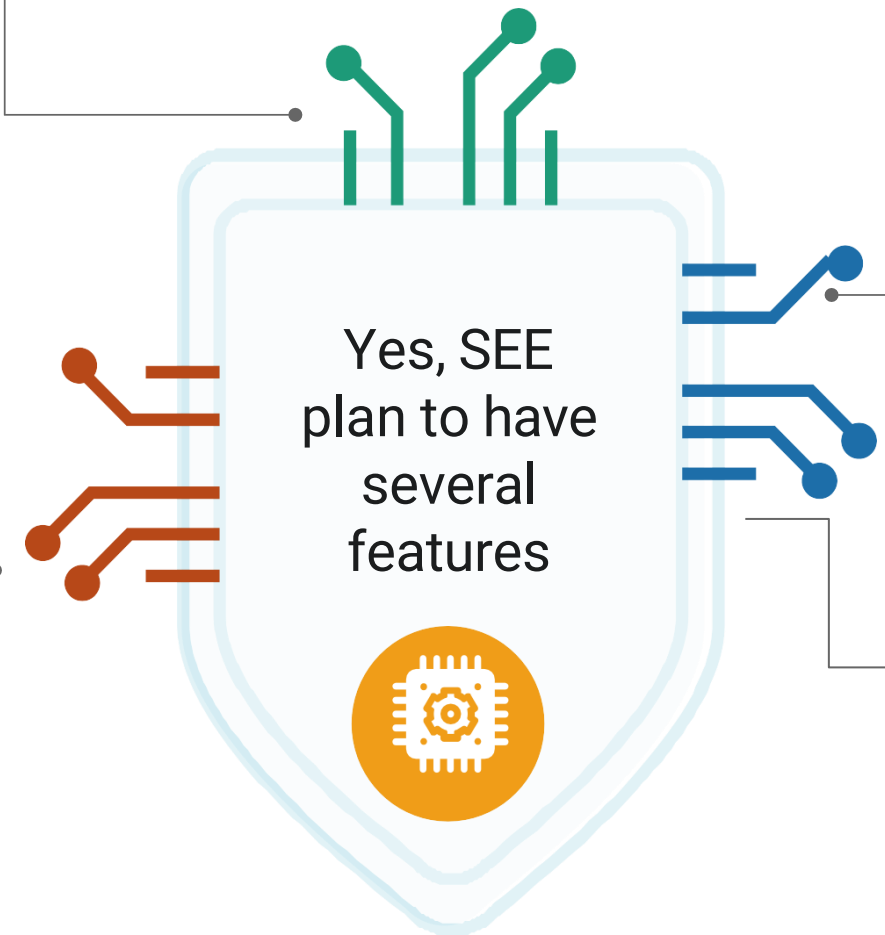

| Activities | Weeks | | | | |
|---|---|---|---|---|---|
| | 1 - 2 | 2-4 | 4-6 | 6-8 | 8-10 |
| Literature survey & Procurement of components required for the projects | 1 | 1 | | | |
| Development of necessary software programming | | 1 | 1 | 1 | |
| Flow diagram design | | | | 1 | |
| Developing a Proposed Model | | | | 1 | |
| Testing and Performance evaluation | | | | | 1 |
| Project Validation Documentation | | | | | 1 |

# Funding


| S.No | Description | Justification | Rough Estimated cost in w Rs. | Reference link |
|---|---|---|---|---|
| 1 | Raspberry pi 4+ | The Raspberry Pi 4 is equipped with a quad-core 64-bit Broadcom BCM2837 ARM Cortex-A53 SoC processor running at 1.2 GHz, making it about 50% more powerful than the Pi 2 | ₹ 4,649.00 | Link |
| 2 | Camera | The camera captures text image of a handwritten or printed text. | ₹699 | Link |
| 3 | Memory card | Storage | ₹769 | link |
| 4 | Glass frame | User friendly wearable structure | ₹1,199 | Link |
| 5 | Speaker/headset | We use general wired Speaker to get the output data. It would be ideal in delivering the exact output. | ₹1,699 | link |
| 7 | Battery | To give power supply for the device | ₹1,499 | link |
| 8 | Connecting jumper wires and cables | To connect the components | ₹79 | link |
| | Total | | ₹10,593 | |

# Revenue Stream

**How is your solution different/unique from other solutions in market? (150 words)**




01

## Subscription Model

Monthly/annual fees for premium features and content

02

## Freemium Model

Basic access for free; advanced features available for purchase.

03

## Partnerships

Collaborations with organizations for distribution and funding.

04

## Grants & Donations

Financial support from nonprofits and government agencies.

Any testimonials received?

# Major Learning Outcomes:

1. **Literature Survey and Research Analysis:**
   Research Proficiency: Developed the ability to conduct thorough literature surveys and critically analyze existing research. Gained insights into the significance of Convolutional Neural Networks (CNNs) and the VGG16 architecture in real-time image classification, particularly in the context of road sign detection and vehicle control.

2. **Software Implementation Skills:**
   Algorithmic Implementation: Acquired practical skills in implementing complex algorithms, specifically the VGG16 CNN algorithm, for automatic road sign detection. Demonstrated proficiency in utilizing machine learning techniques for real-time applications, enhancing understanding and application of computer vision in practical scenarios.

3. **Hardware Implementation Expertise:**
   Raspberry Pi Integration: Developed expertise in configuring Raspberry Pi and integrating it with web cameras for real-world applications. Demonstrated practical knowledge in choosing cost-effective and efficient hardware solutions, contributing to the implementation of road sign detection and vehicle control systems.

Continue …

4. **Team Collaboration and Communication:**

Effective Team Dynamics: Enhanced collaboration skills through teamwork. Contributed and shared research findings, fostering a collaborative environment where each team member's expertise in areas like machine learning, software implementation, and hardware integration was leveraged for the project's success.

**5**. **Product Development and Practical Applications:**

MVP Development: Applied theoretical knowledge to develop a Minimum Viable Product (MVP). Understood the iterative process of product development, from design stages to the selection of a user-friendly model. Gained practical experience in translating concepts into real-world applications.

**Project Specific Outcome:**

Real-World Impact Developed an understanding of the critical role CNN VGG16 plays in real-time road sign detection and vehicle control. Recognized the potential implications for road safety and the reduction of accidents caused by human error. Explored the broader applications of machine learning and computer vision in areas such as autonomous vehicles and smart cities, demonstrating an awareness of technology's impact on society.

# Why should our project win?

our project deserves to win because it combines innovation, impact, cost-effectiveness, and simplicity to address a critical societal issue – road safety. By revolutionizing the way road signs are detected and interpreted, we're paving the way for a safer, more efficient transportation system for everyone.

**Impact**: Our project, "Automatic Road Sign Detection and Vehicle Control Using Neural Networks," promises to have a profound impact on road safety. By proactively detecting road signs and enabling automated vehicle control based on this information, we're directly addressing one of the leading causes of road accidents – driver negligence. With the potential to prevent countless accidents and save lives, our project stands to make a significant positive impact on society.

**Innovation**: Our project stands at the forefront of innovation in the field of intelligent transportation systems. By harnessing the power of deep learning algorithms, specifically the VGG16 Convolutional Neural Network architecture, we're revolutionizing the way road signs are detected and interpreted in real-time. This innovative approach not only improves accuracy and reliability but also sets a new standard for road safety technology.

Continued…

**Cost-Effectiveness**: Utilizing the Raspberry Pi platform and minimal additional components, our solution offers a cost-effective alternative to traditional road safety systems. By leveraging affordable hardware and open-source software, we're making advanced safety technology accessible to a broader audience, including individuals and organizations with limited resources.

**Simple Architecture**: With a streamlined architecture comprising Raspberry Pi, camera, and neural network model, our solution embodies simplicity and efficiency. This simplicity not only facilitates easy deployment and maintenance but also enhances scalability and adaptability to diverse environments. By eliminating unnecessary complexities, we're ensuring that our technology remains accessible and user-friendly for all stakeholders.

# Opportunity

## Don’t skip the existence

### Focus

- CTS – COGNIZANT- Technoverse
- ACCENTURE-INNOVATION CHALLENGE
- EY-challenge
- E-yantra-Robotics-competition
- TATA
- Startup-TN
- EDII
- Niral Thiru Vila
- SEED
- And use unstop, lindklin  etc,,,,,,,,

# Platform

- Follow The principal email
- Check the department notice board
- Unstop
- Techgig
- Hackerrank
- Kaggel
- Hack2skils

# Learn your books and
# Follow your parent and Teachers

# Find your road map…….

# Problem statement Title

- Smart City Innovations for Sustainable Living
- Enhancing Accessibility through Technology
- Future of Healthcare: AI-Driven Diagnostics
- Automated Waste Management Solutions
- Financial Inclusion through Digital Platforms
- Bridging the Education Gap with Tech
- Next-Gen Road Safety and Accident Prevention
- Climate Action: Predicting and Preventing Disasters
- Data-Driven Solutions for Mental Health
- Revolutionizing E-commerce with AI and AR

# Challenge Framing Canvas

Organization / Author

Date

PROBLEM TO SOLVE
What is the core problem we want to solve? Why is this challenge important?

HOW MIGHT WE...
Include the ACTION you want to take (redesign, improve, enable), SUBJECT (user, customer, company, object, item) to be influenced or affected so that OUTCOMES you would like to achieve (frictionless, affordable, fun)

DESIRED OUTCOMES
What are our desired outcomes? What solutions do we hope to see realized? What impact do we want to have?

TARGET GROUP
For whom do we want to solve a problem? Who should benefit from the solution?

RELATED INITIATIVES
What projects does this challenge support? What internal resources can we leverage?

PARTICIPANTS
Who do we want to involve in the team? Which skills do we need to tackle the challenge? Do we have these skills internally or should we look outside the organization?

PARTNERS
What partners do we want to involve in the challenge? How could they support the challenge?

# Let’s play the GAME

# ICE BREAK SECTION

# Transitors! Spark to semiconductor industries

intel
NVIDIA
XILINX
ANALOG DEVICES
Micron
tsmc
AMD
MICROCHIP
NXP
ON Semiconductor
CYPRESS
maxim integrate
SAMSUNG
LINEAR TECHNOLOGY
Texas Instruments
ATMEL
AMD
NORDIC SEMICONDUCTOR
TOSHIBA
Qualcomm

# LIST THE COMPANY LIST


14
30622
LABORATORY DC POWER SUPPLY

# LIST THE COMPONENT LIST

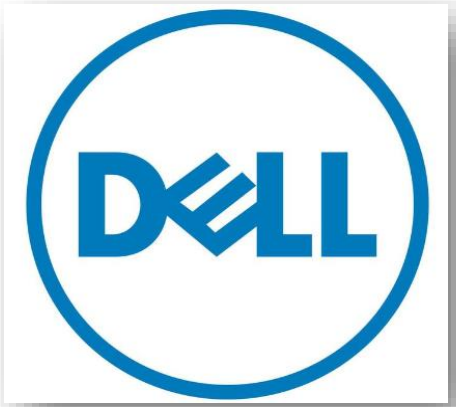
# CONNECT IT…….!!!!!!

# CONNECT IT…….!!!!!!

# CONNECT IT…….!!!!!!

CONNECT IT…….!!!!!!


…….!!!!!?????


DELL


Mac


Windows


ASUS


hp


lenovo


SAMSUNG

 +  + 

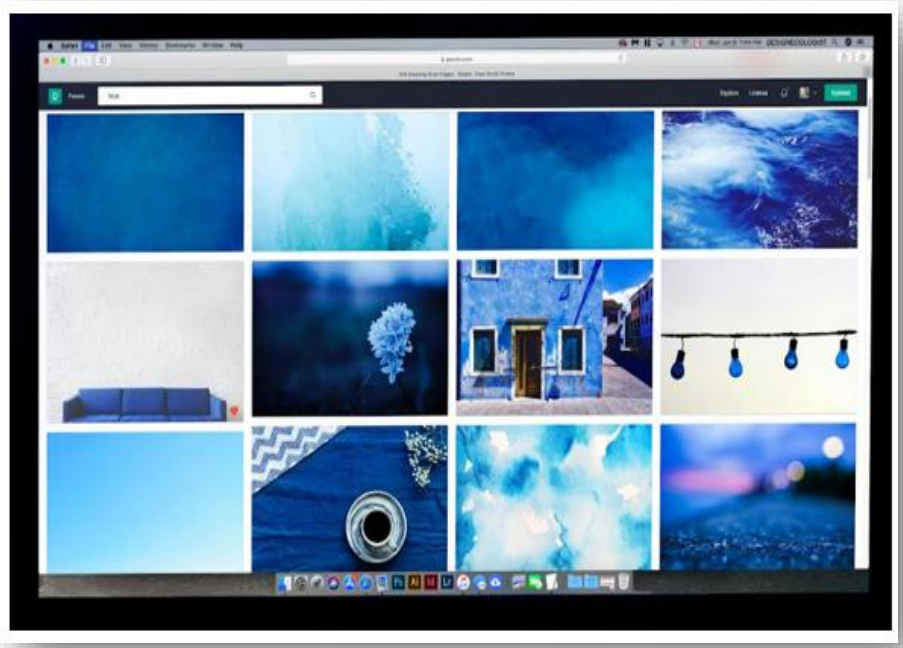
# WHICH LOGO IS CORRECT?



RUMMY

+


SBI



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# WHICH LOGO IS CORRECT?

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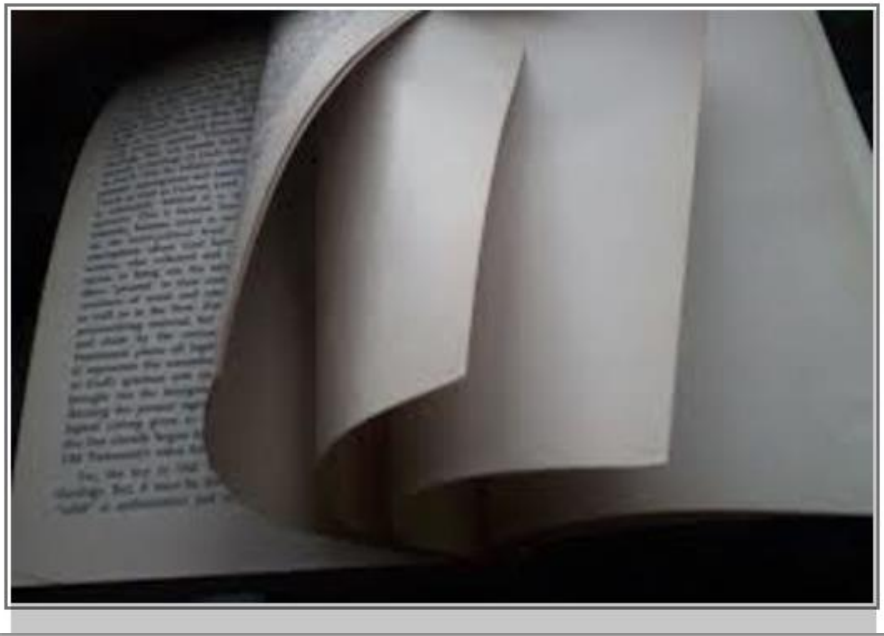

# WHICH LOGO IS CORRECT?


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31036

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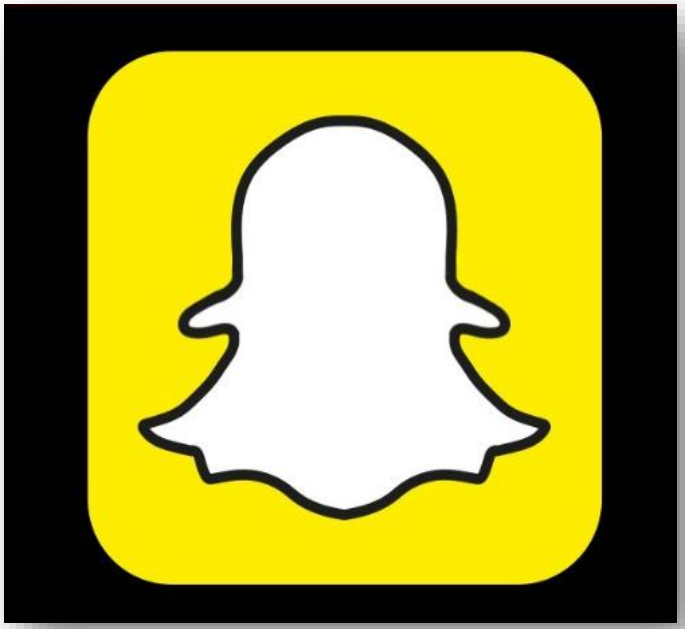
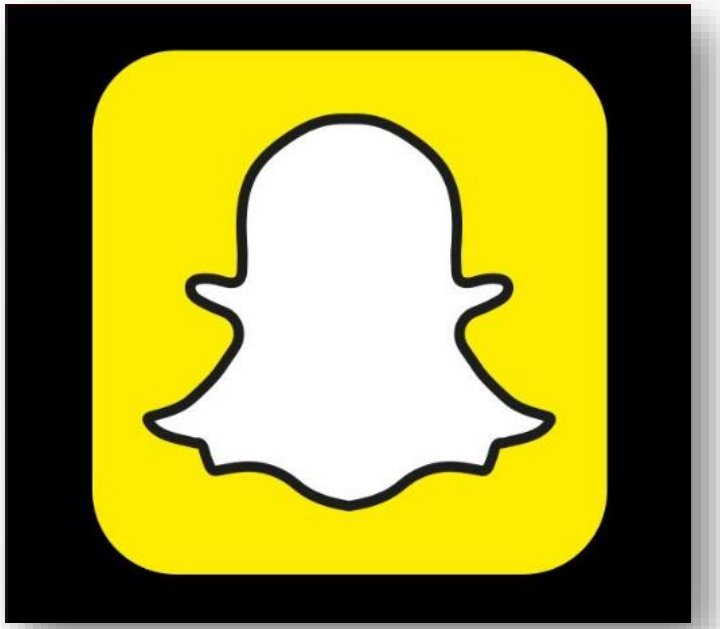
# WHICH LOGO IS CORRECT?





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# WHICH LOGO IS CORRECT?


# How! Where!
# Projects

- **AI & ML  REAL-TIME PROJECTS**
  **https://youtu.be/4O1rs7mrNDo?si=nQx13JEMw2lvHTPD**
- **IOT-EMBEDDED SYSTEM**
  **https://youtu.be/5xKyZrwn2t8?si=kneGv90jGYxYAn-k**
- **VLSI AND SYSTEM DESIGN**
  **https://youtu.be/rWOQ3qwH02g?si=s1QEr8xIBmN-zSUO**
- **DEVOPS**
  **https://youtu.be/Ou9j73aWgyE?si=9wO9MAz2ceM48rb0**
- **DJANGO IN PYTHON**

**https://youtu.be/g5vFWHajutg?si=TJNvLM2-7WSN2Ah2**

- **DIGITAL MARKETING (SEO)**

**https://youtu.be/9ZxHSIaP_6A?si=ySxy787MZPjC7V5i**

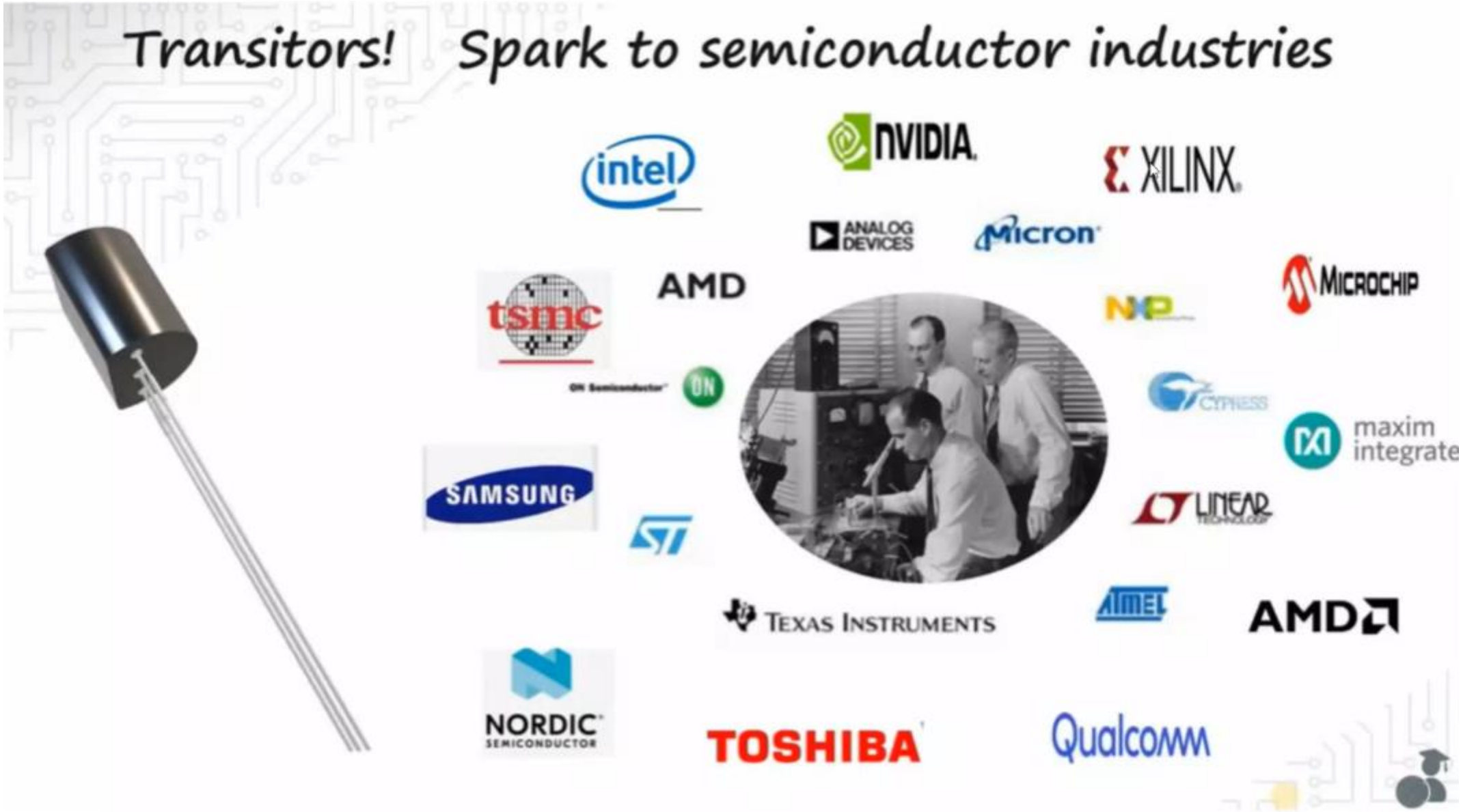
- **VERILOG**

**https://youtu.be/YE-JrestfRw?si=LCu-ZTpjGPyeUAua**

# What is the role

1.Electronics Design Engineer
2.Networking Engineer
3.Embedded Systems Engineer
4.Telecom Engineer
5.VLSI Design Engineer
6.Signal Processing Engineer
6.Software Developer
7.Data Analyst
8.AI/ML Engineer
9.IoT Developer

# இது நம்ம COMPANY



# What and why LTSPICE

- What ?
  - Analog part of pspice simulation software
  - Drawing interface and component library provide by LTC
- Why ?
  - Free download on

    www.linear.com/designtools/software/
  - Easy to use
  - But only analog analysis

# Objective

- See the different ways to use this software
- Use LTSpice as an help during futur studys and projects

# OVERVIEW

## Main simulation tools

- .OP : calculate the opearting point of a circuit
- .DC : the same as .OP but for several value of one/several voltage(s) or current source. The result is given in a graph
- .TRAN : use simulator as a scope to see the timing diagram of differents signals
- .AC : calculate the frequency response of circuit

# Analysis

## Different steps to perform a simulation

1. Create a new sheet and save it on a folder specially created for all the files of the simulation
2. Drawing schematic
   - Place and move component. Don't forget the ground
   - Place wire to connect components
   - Place label to mark the most important node
3. Set the analysis (.OP, .DC, .TRAN or .AC)
4. Run simulation
5. Interpret results

# Drawing schematic

## Place and move component

Select component by press a key or click on the correspondant pictures in the tool bar

| Component | Press Key | Click | Component | Press Key | Click |
|---|---|---|---|---|---|
| Resistor | R |  | Diode | D |  |
| Capacitor | C |  | Other component | F2 key |  |
| Inductor | L |  | Ground | G |  |

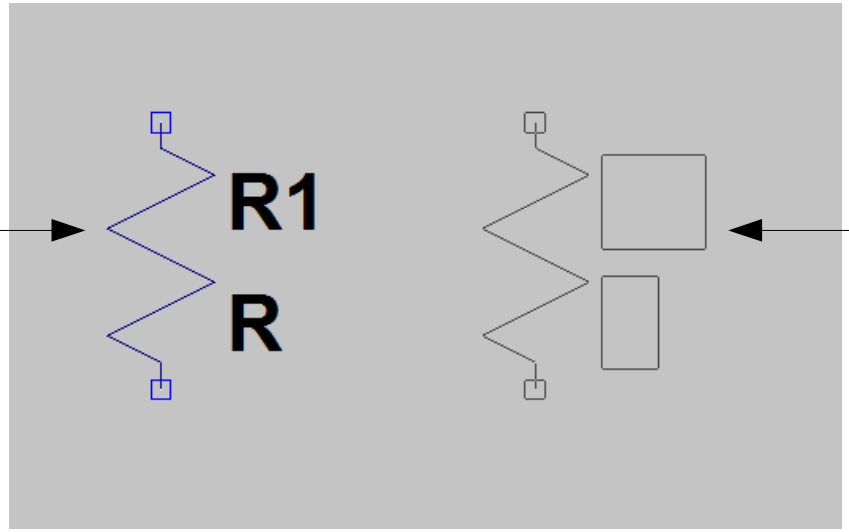
Move the mouse until the position you want, and left click to place the component.

# Drawing schematic

## Place and move component

To move and rotate a componant, it must be select (grey). It's not, select it whith  and use « CTRL+R » to turn it, and mouse to move it.

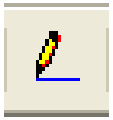
Fixed component, cannot move or rotate




Not fixed component, can move and rotate

# Drawing schematic

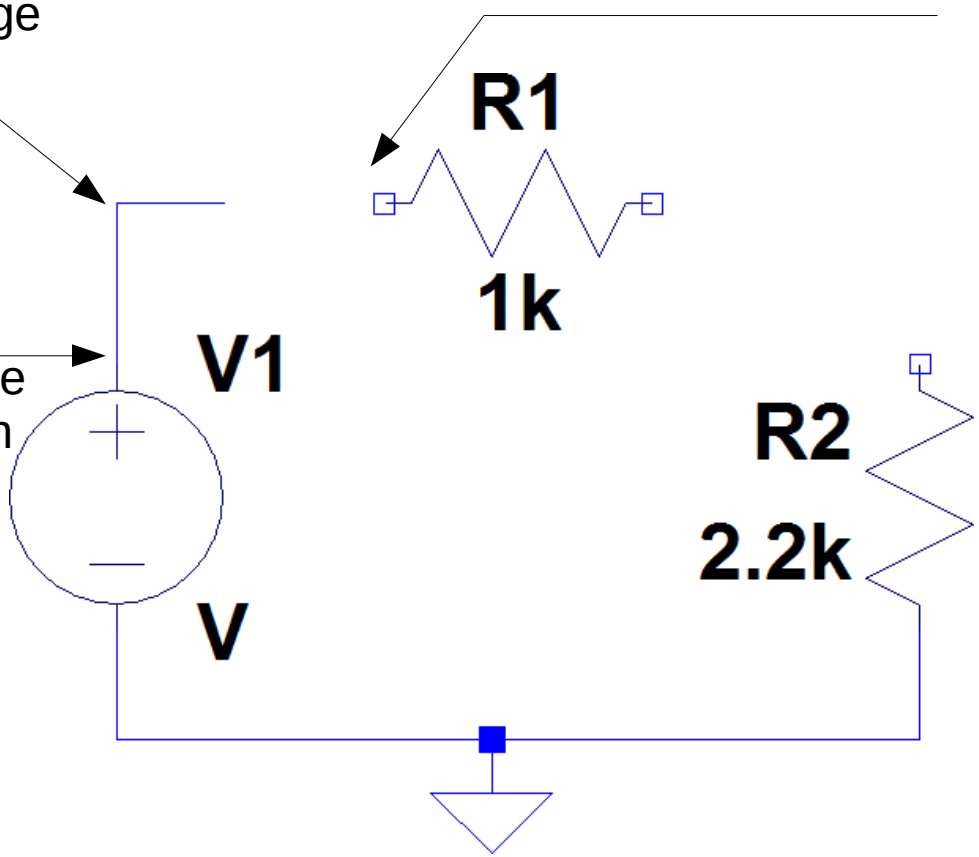
## Connect component : trace wire

Press «  F3  » key or click on  to select wire tools.

Left click to change direction

Left click on the terminal point of one component to begin

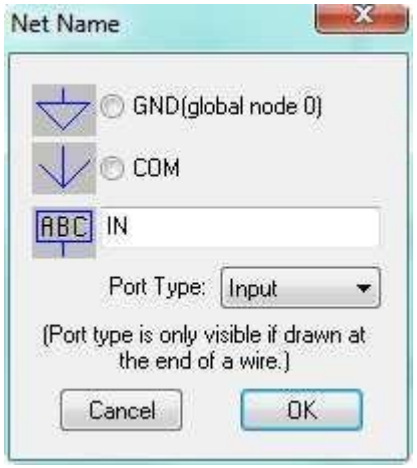
Left click on the terminal point of the other component what you want connect, or riht click to finish the wire



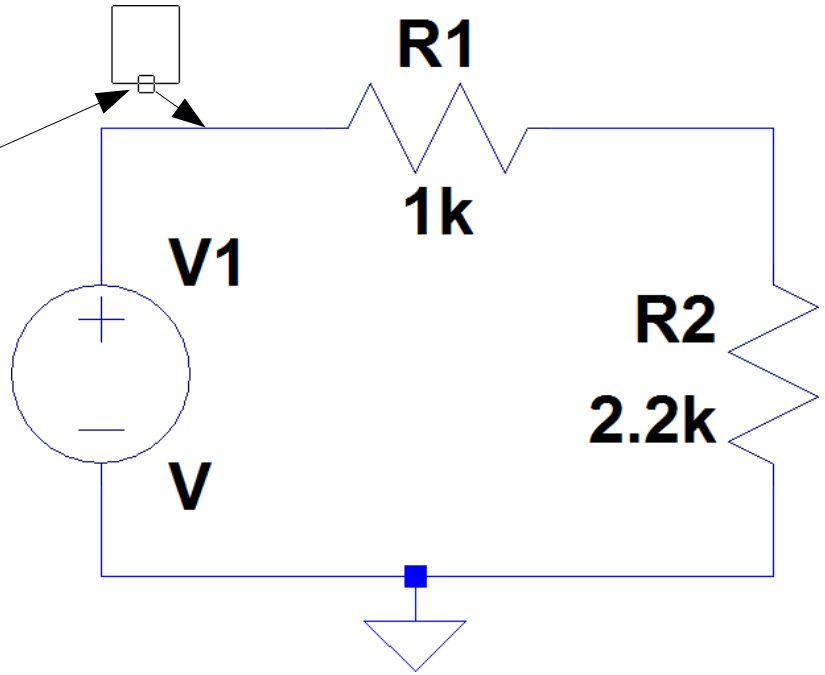
# Drawing schematic

## Place label

Press «  F4  » key or click on  to select label tools.



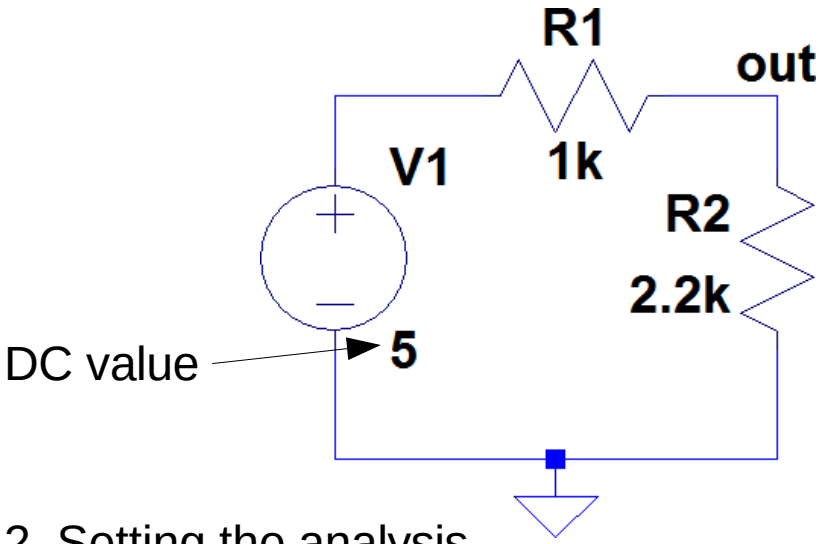

Place the node on the wire on what you want give name.



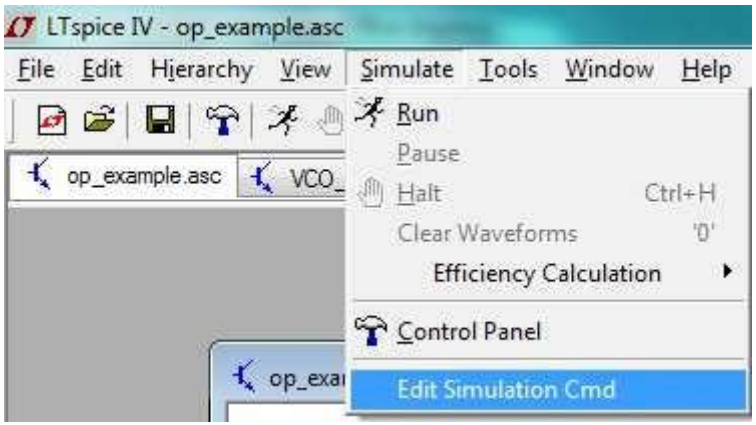

***Comment : label can also be use to connect 2 nodes. Just give the same name at the 2 nodes***

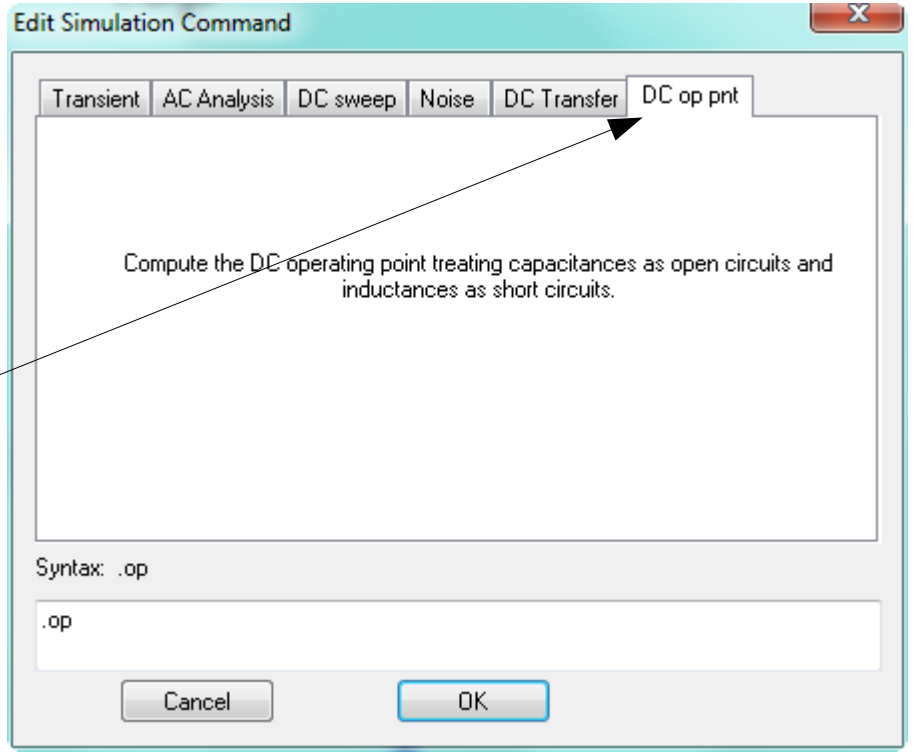
# .OP analysis

1. Draw the schematic study, and modifie (Right click on V) the DC voltage of V1



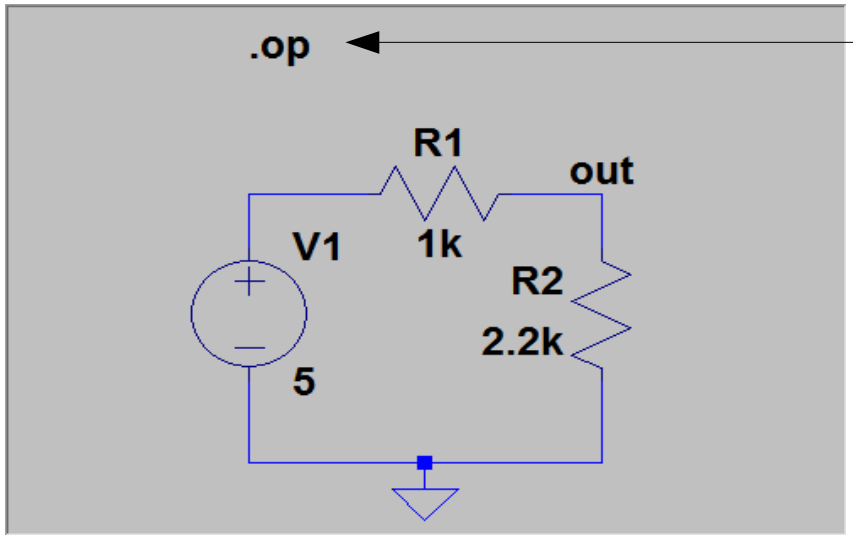

2. Setting the analysis



# .OP analysis

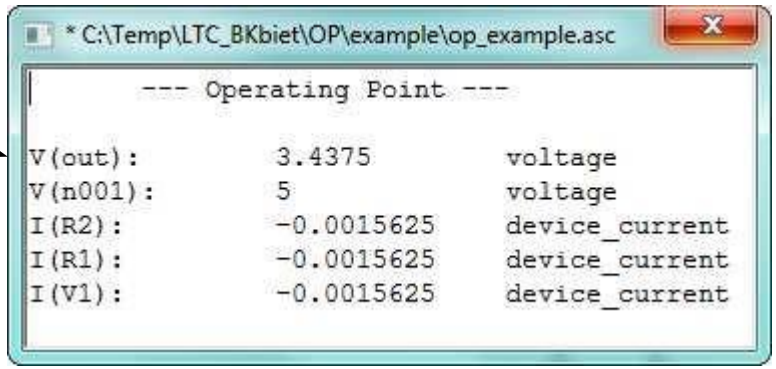
3. Click on schematic to valid your choice




left click on the schematic to put it

4. Run the analysis 

A new window appears and contains the value of the operating point



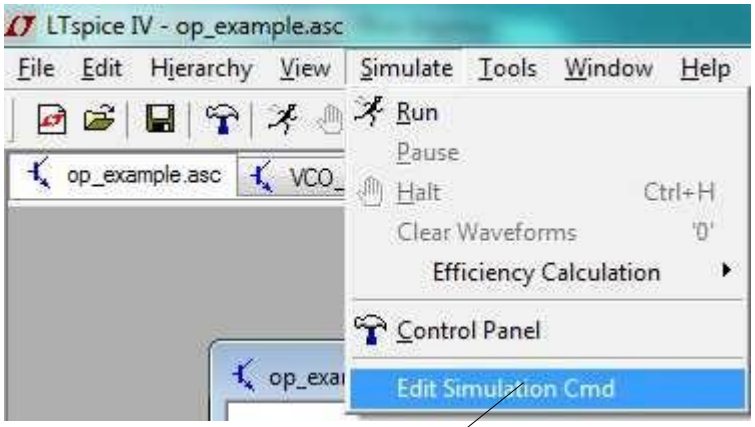
# .DC analysis

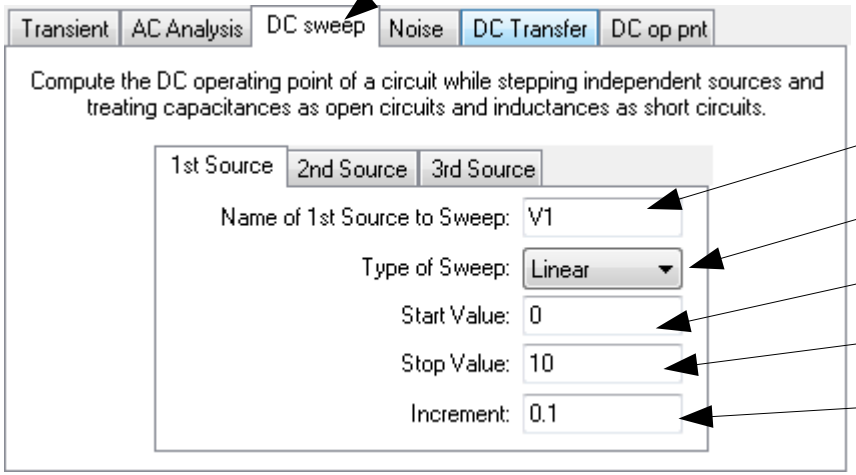
- Perform .op analysis for any value of one (or more) voltage (or current) source(s).
- Example: with the same circuit,we want to know how change the output voltage, if the input change.
- You need only change the analysis setting by choosing DC sweep

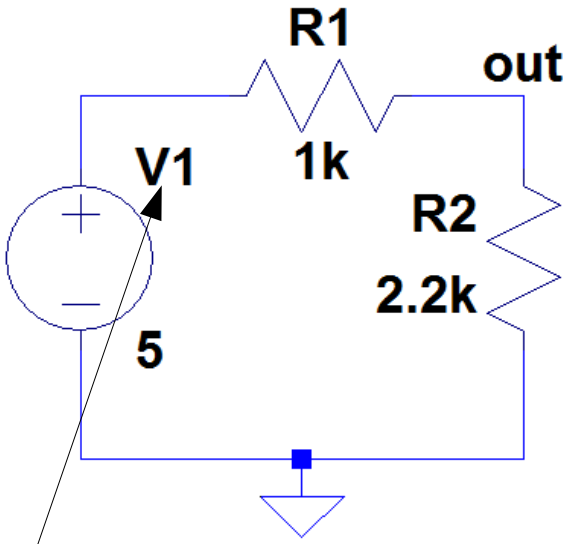
# .DC analysis

## Setting

- Setting the DC sweep analysis




Name of the source which change of value

Linear, octave, decade or list of value

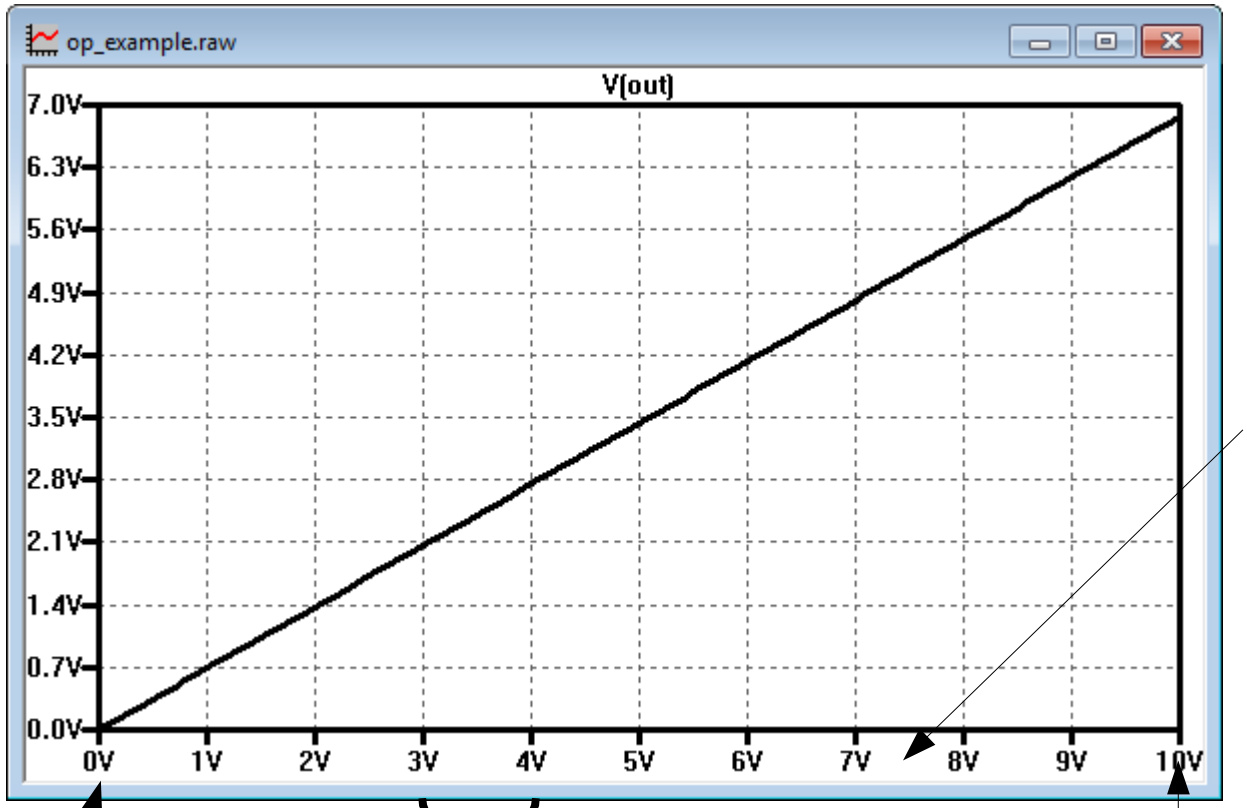
First value simulate

Last value simulate

Voltage range between two simuation

# .DC analysis
## Result

- Result is a graph :




Linear scale

Horizontal axis : value of V1

Start value

Step between 2 values

Stop value

**AND Truth Table**

| Inputs | | Output |
|---|---|---|
| A | B | Y = A.B |
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

**OR Truth Table**

| Inputs | | Output |
|---|---|---|
| A | B | Y = A+B |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

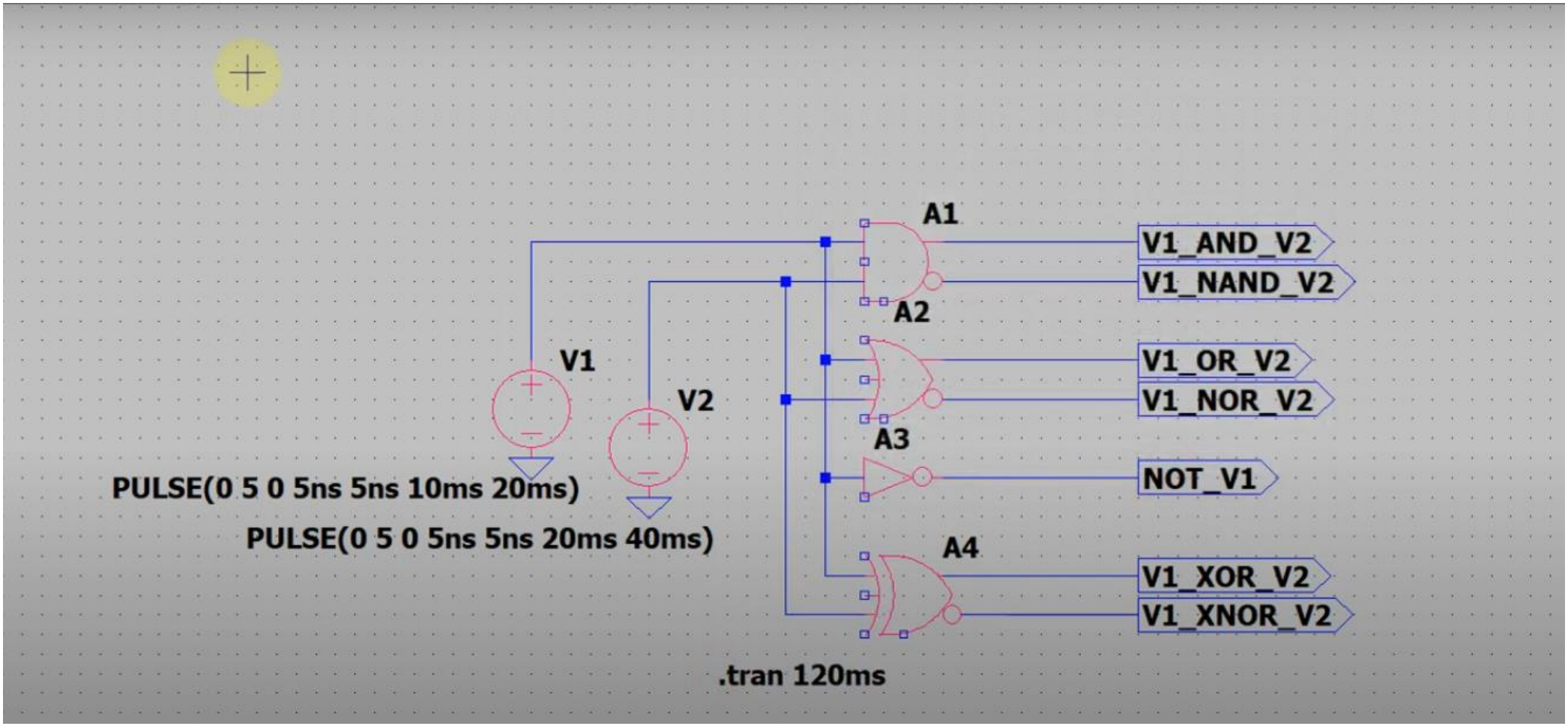
**XOR Truth Table**

| Inputs | | Output |
|---|---|---|
| A | B | $Y = A \oplus B$ |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

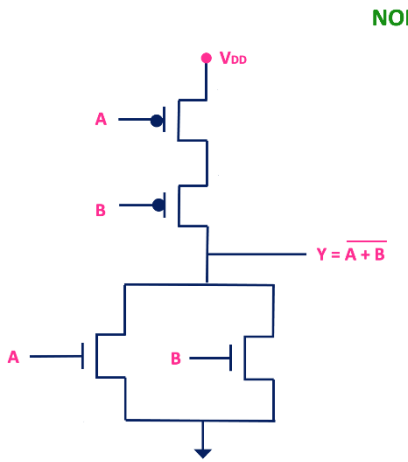
**NAND Truth Table**

| Inputs | | Output |
|---|---|---|
| A | B | $Y = \overline{A.B}$ |
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

# Basic 2-Input Logic Gates simulation

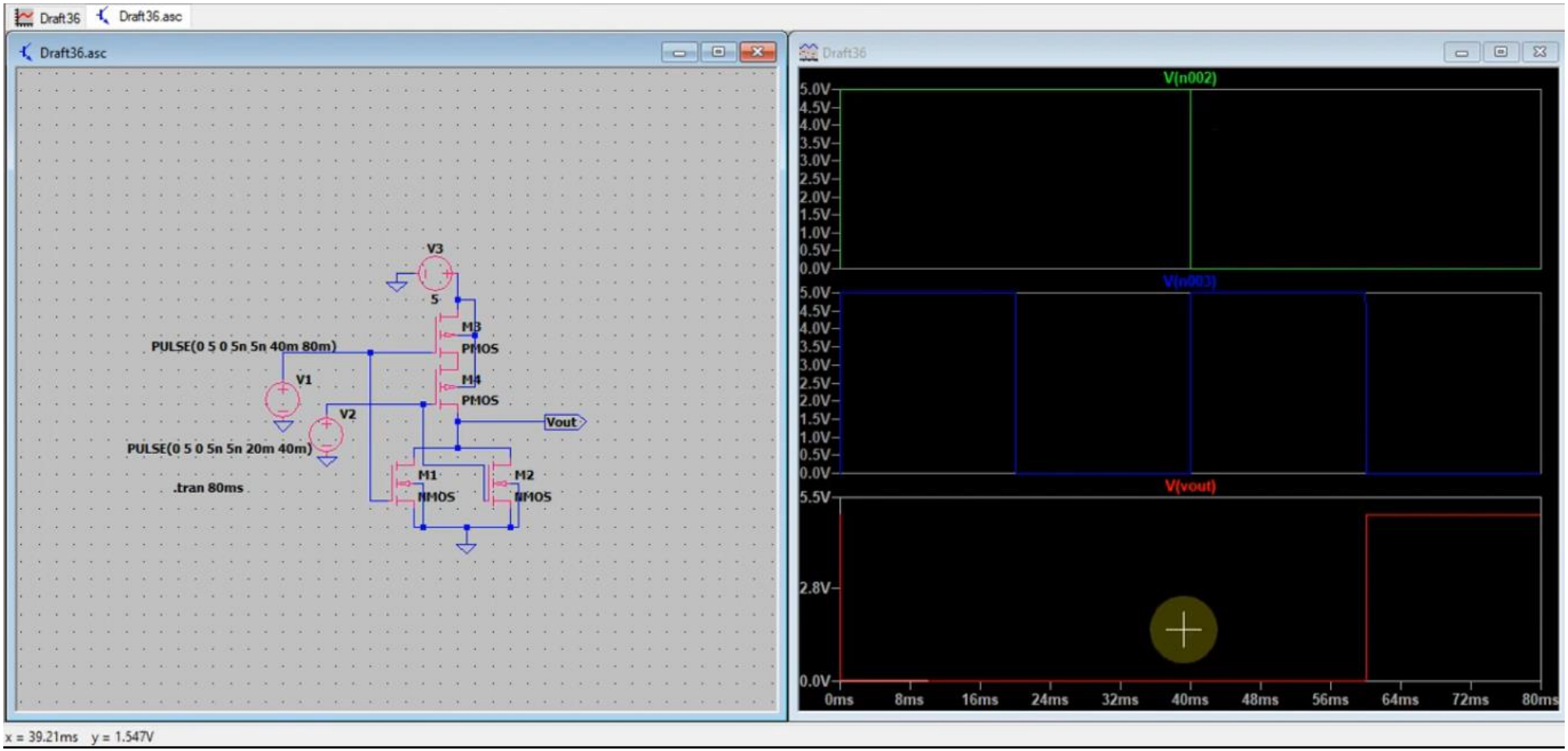


# NOR gate using CMOS in LTSpice

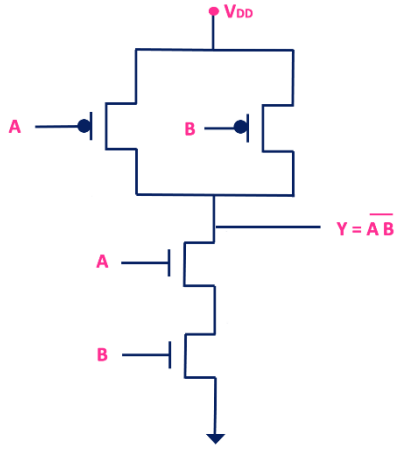



Truth Table

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

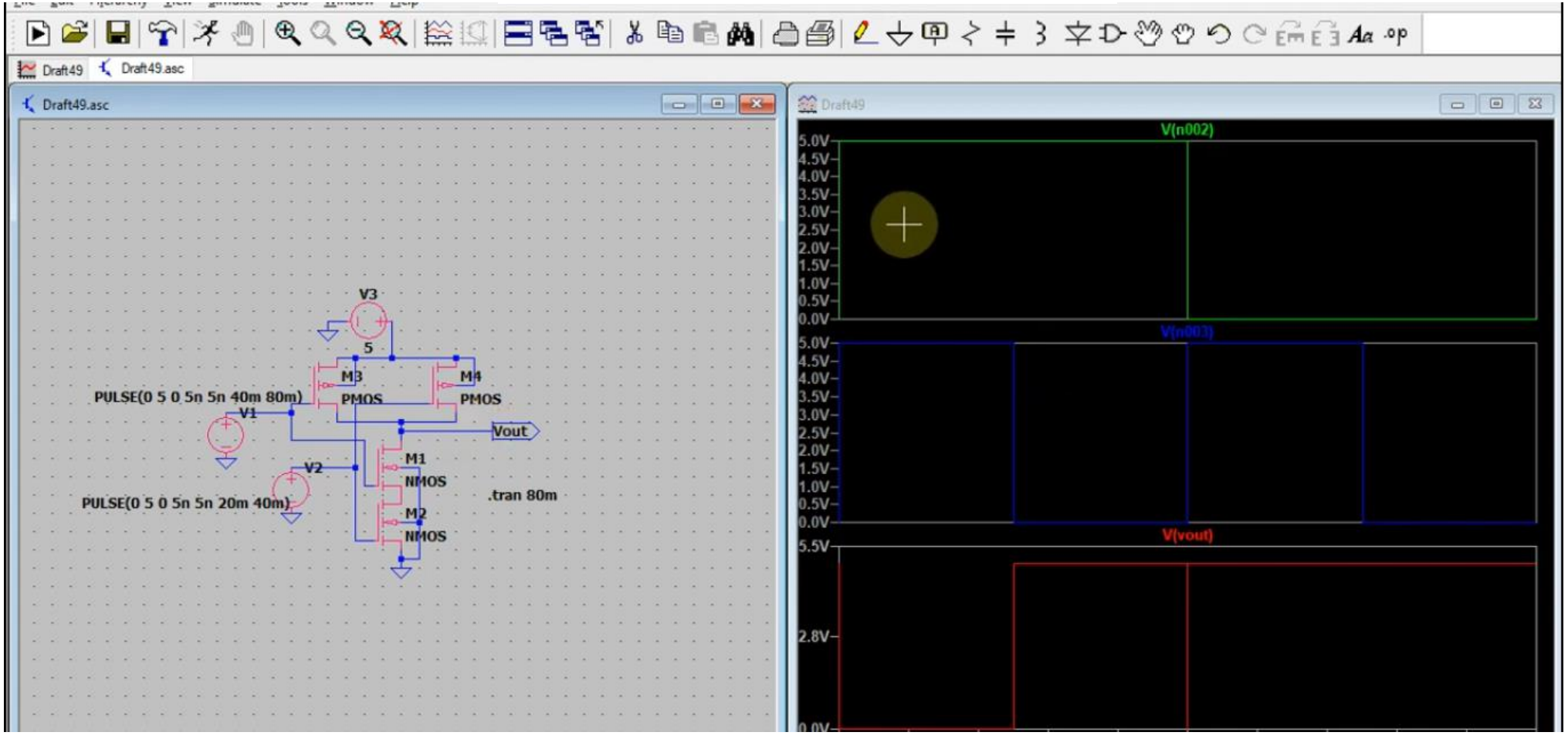


# NAND using CMOS in LTSpice

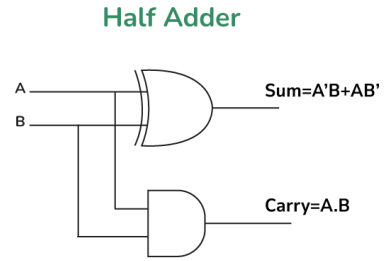



Truth Table

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

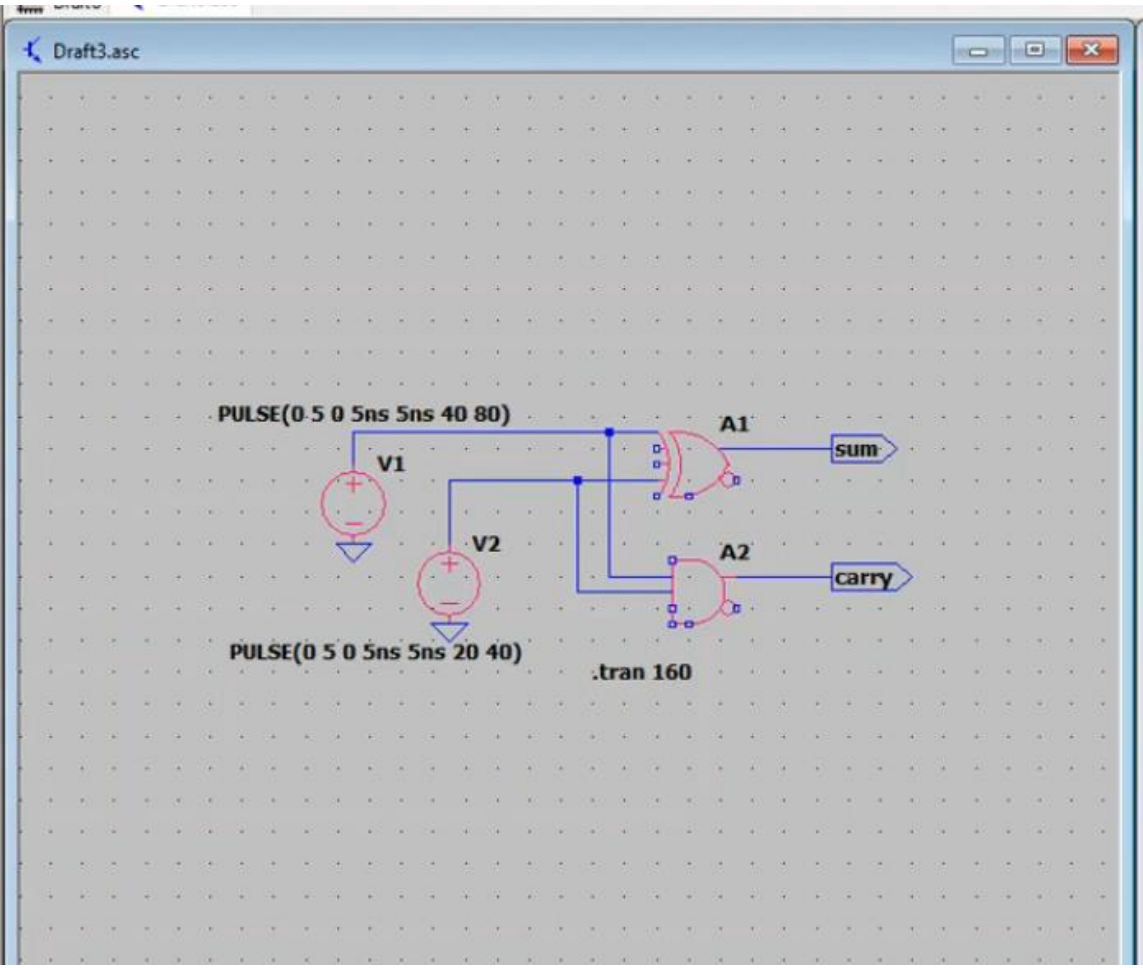


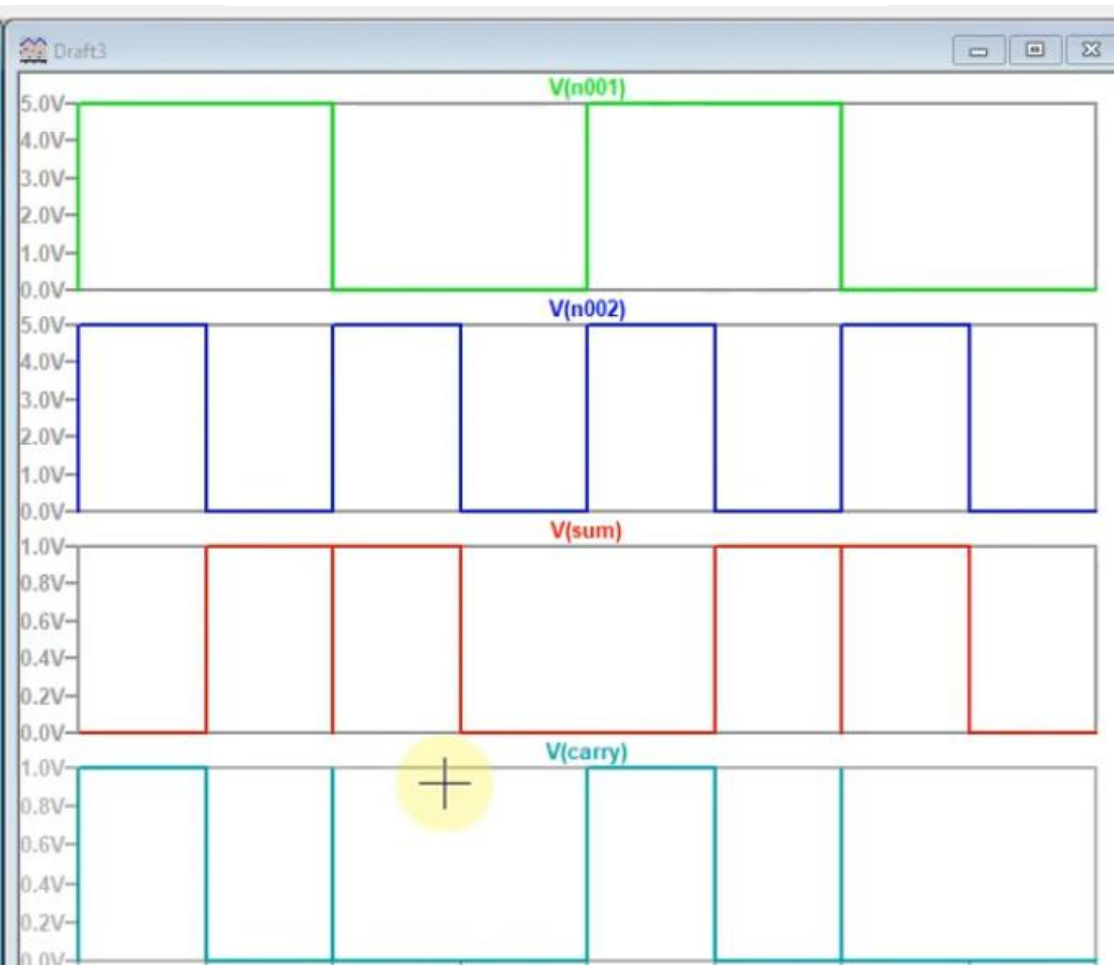
# Half Adder simulation in LTSpice




**Truth Table**

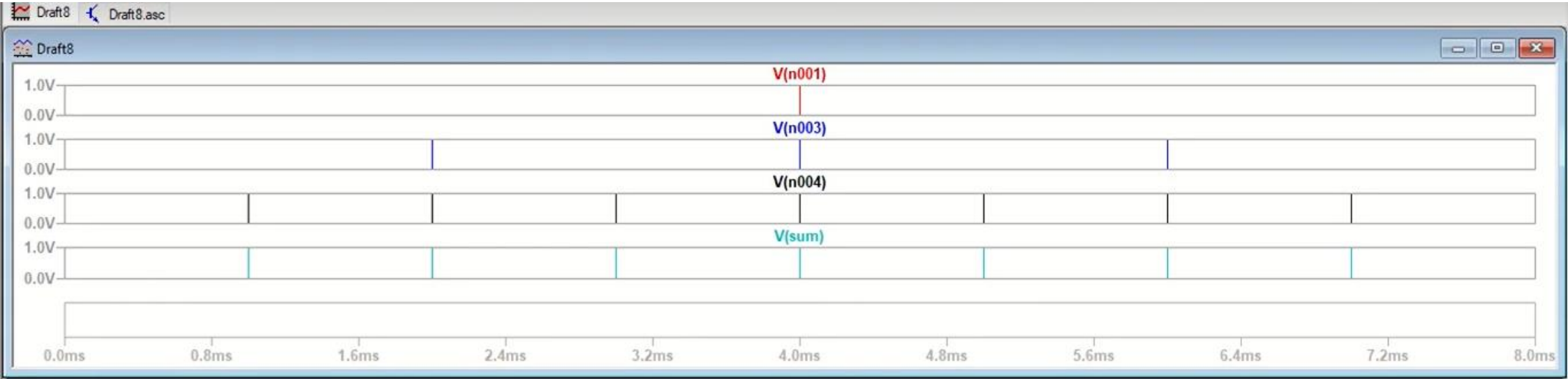
| A | B | S | C |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |

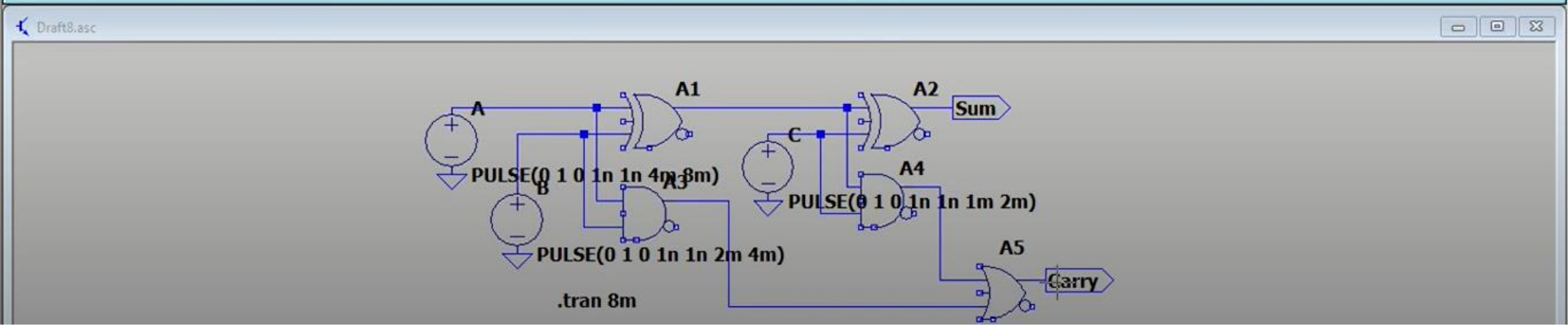


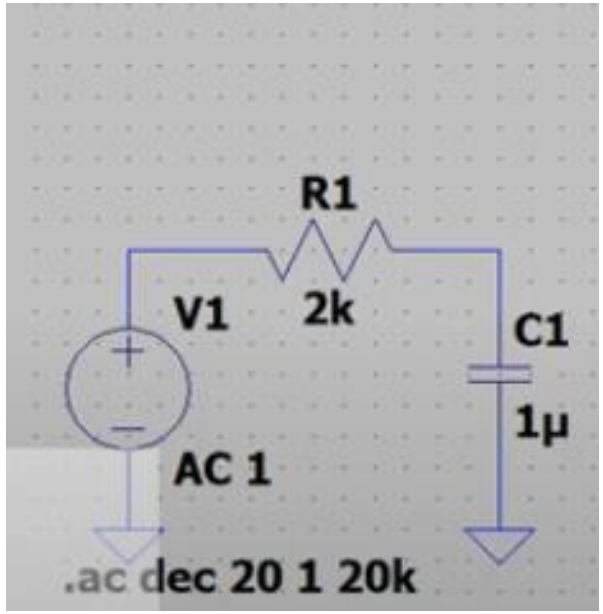
# Full Adder

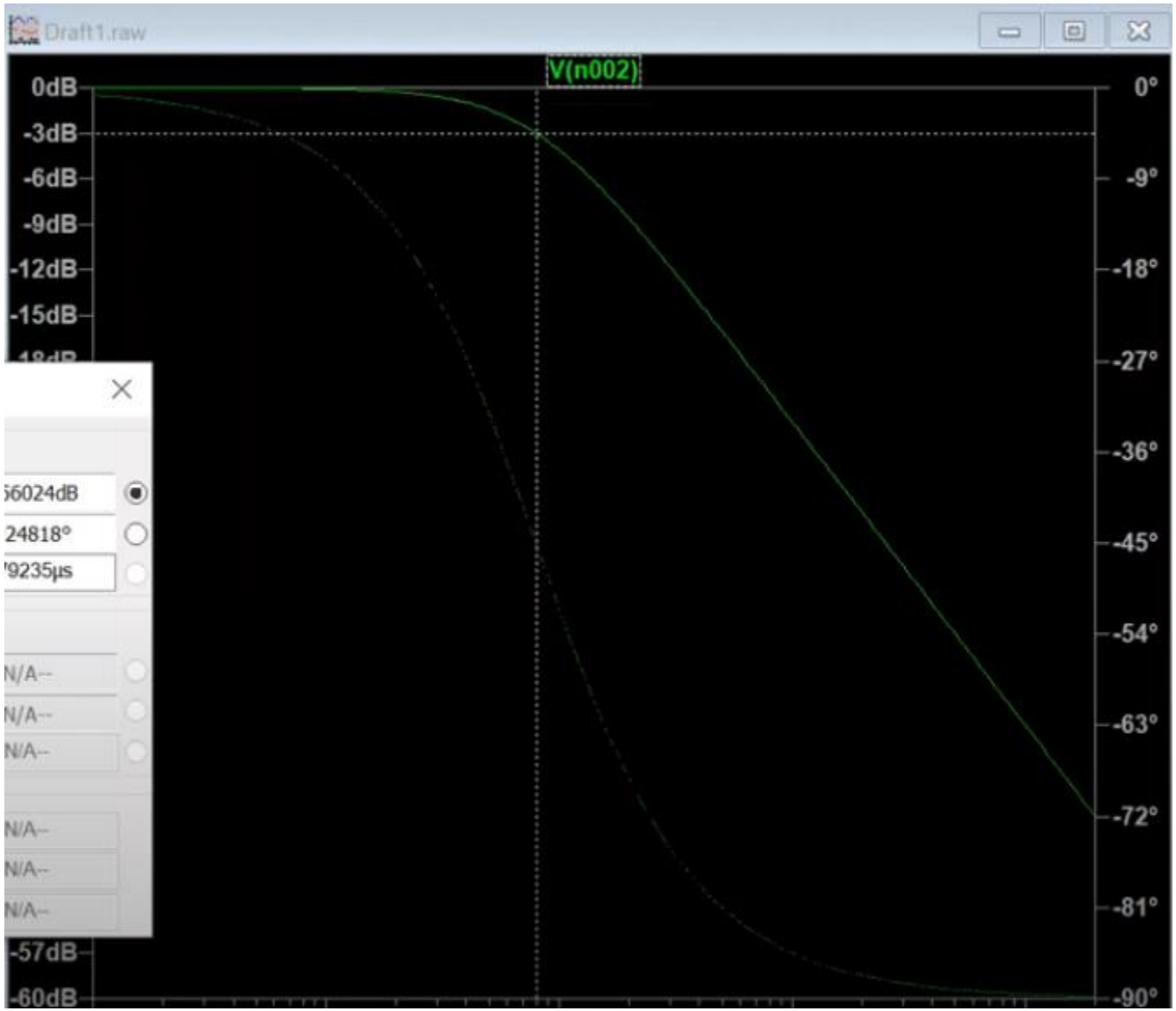
| Inputs | | | Outputs | |
|---|---|---|---|---|
| A | B | $C_{in}$ | Sum | Carry |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 |
| 1 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |



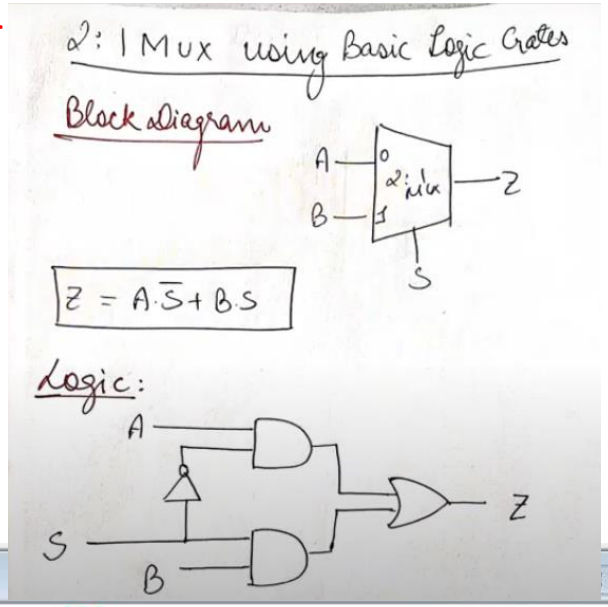



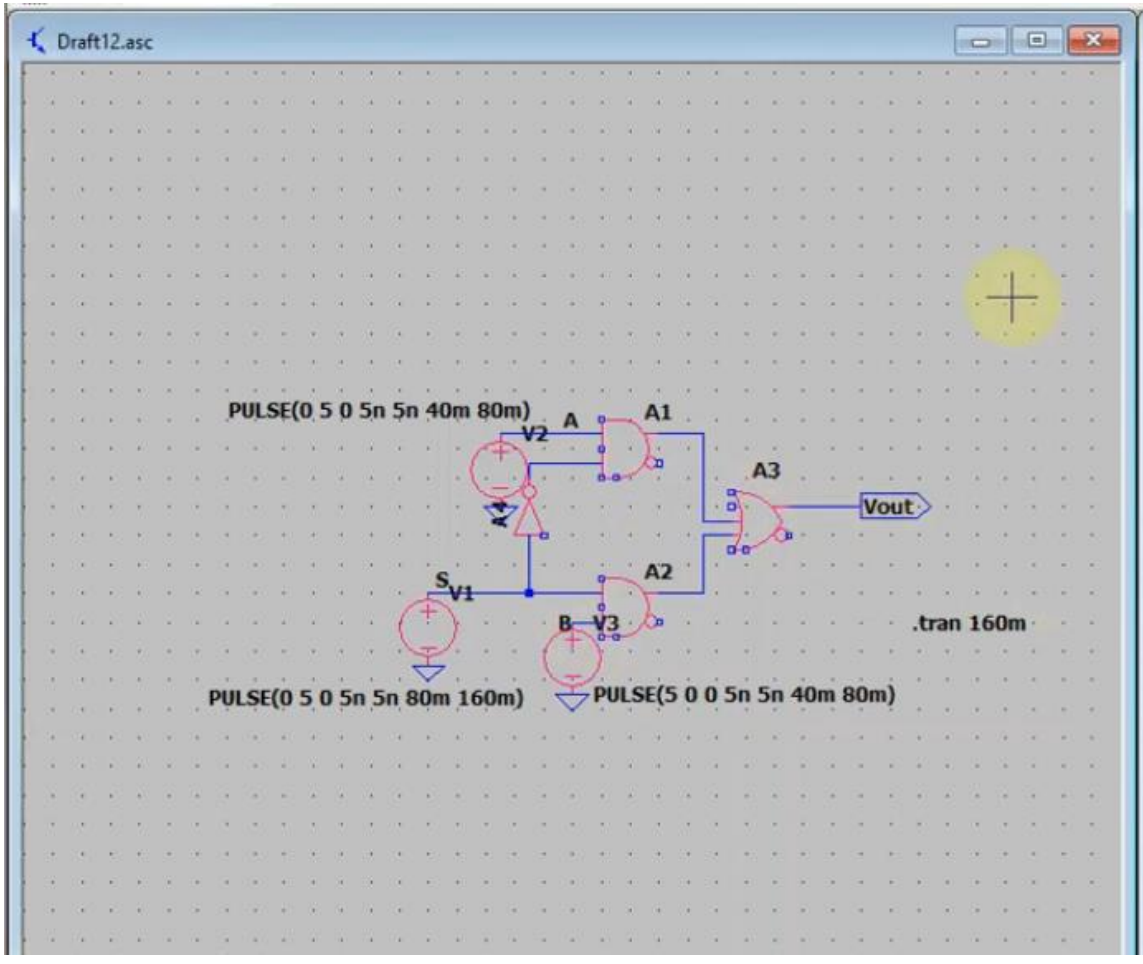
# Low pass filter simulation in LTSpice

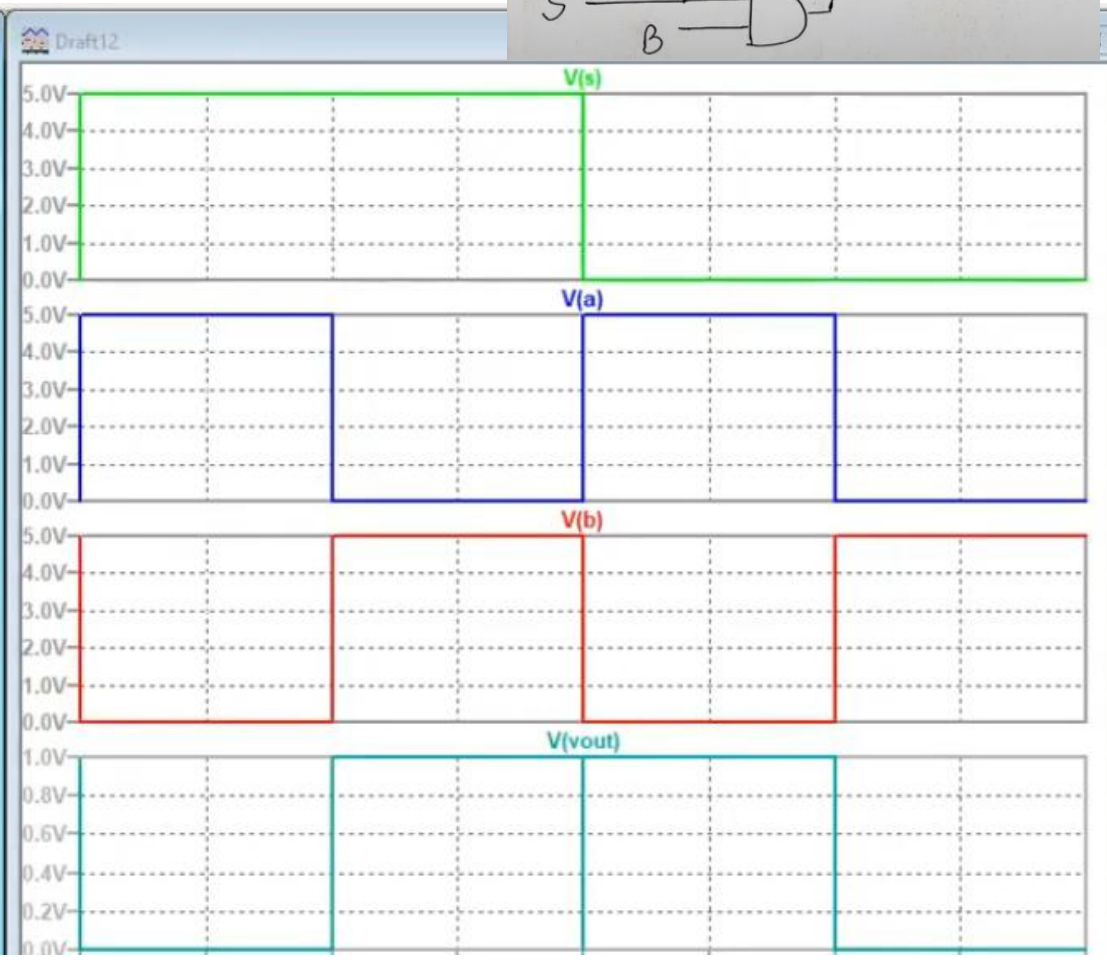


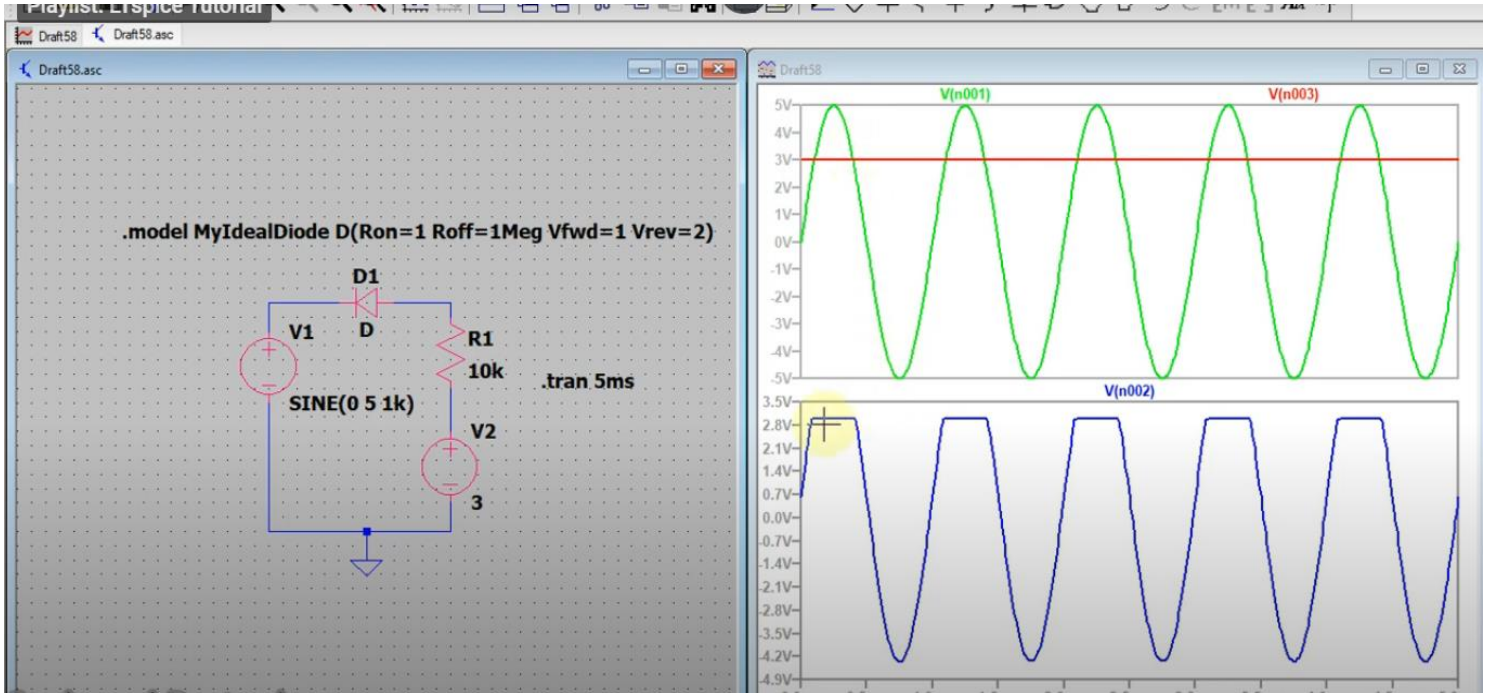
# 2:1 MUX Simulation in LTspice

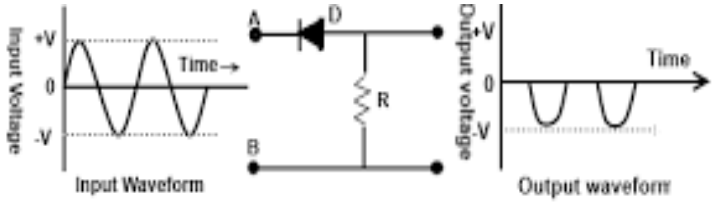


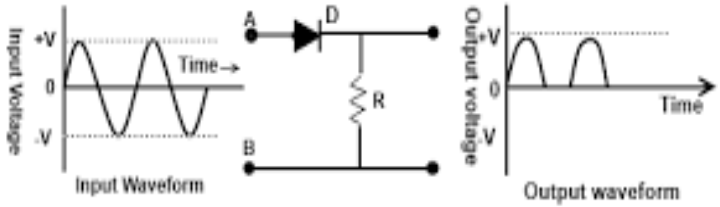



# Clipper Circuit simulation in LTspice



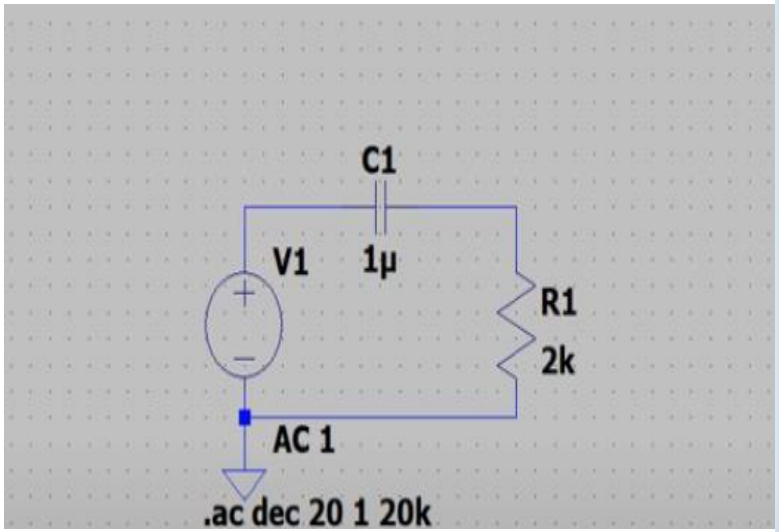



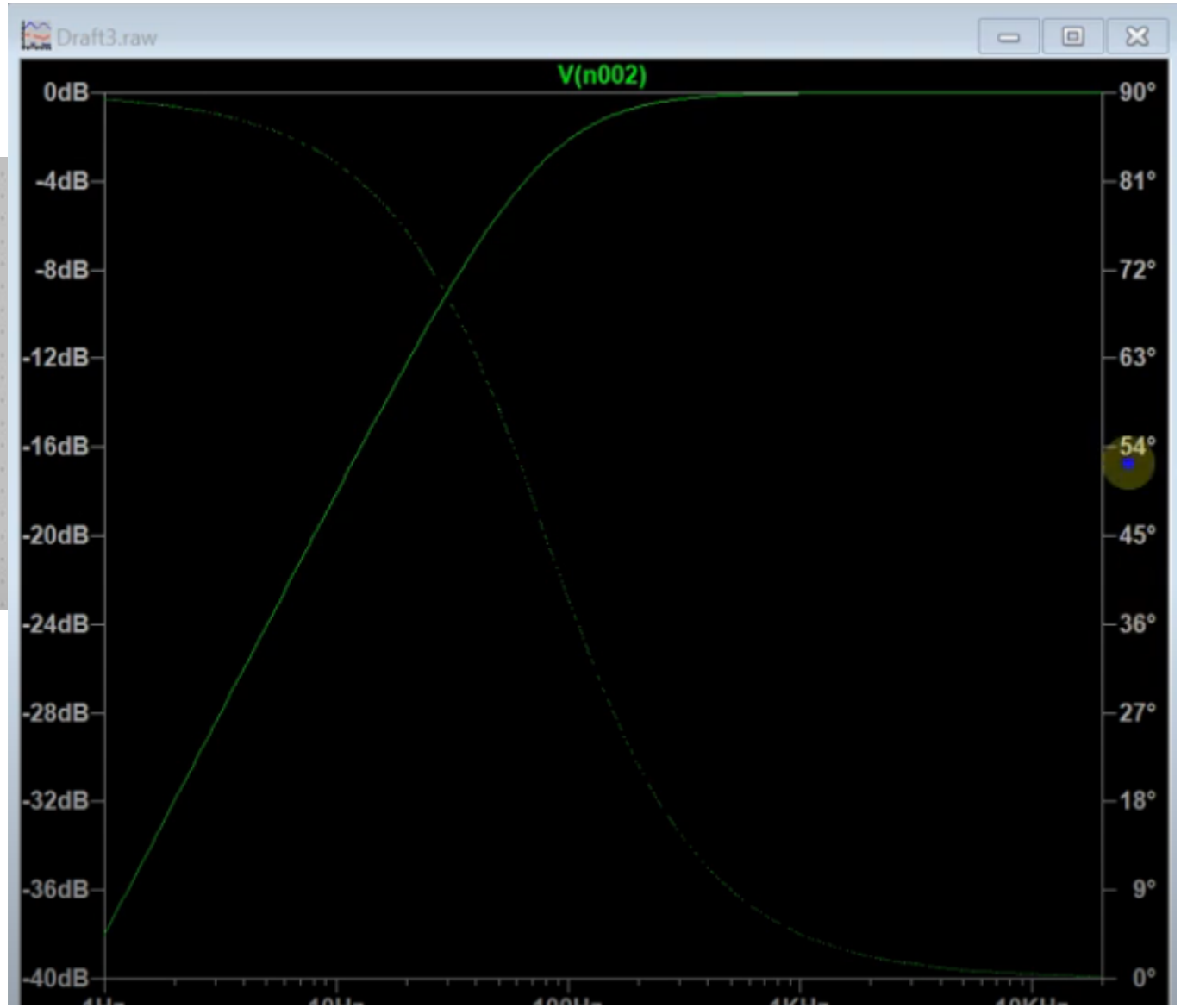

*(a) Positive clipper*



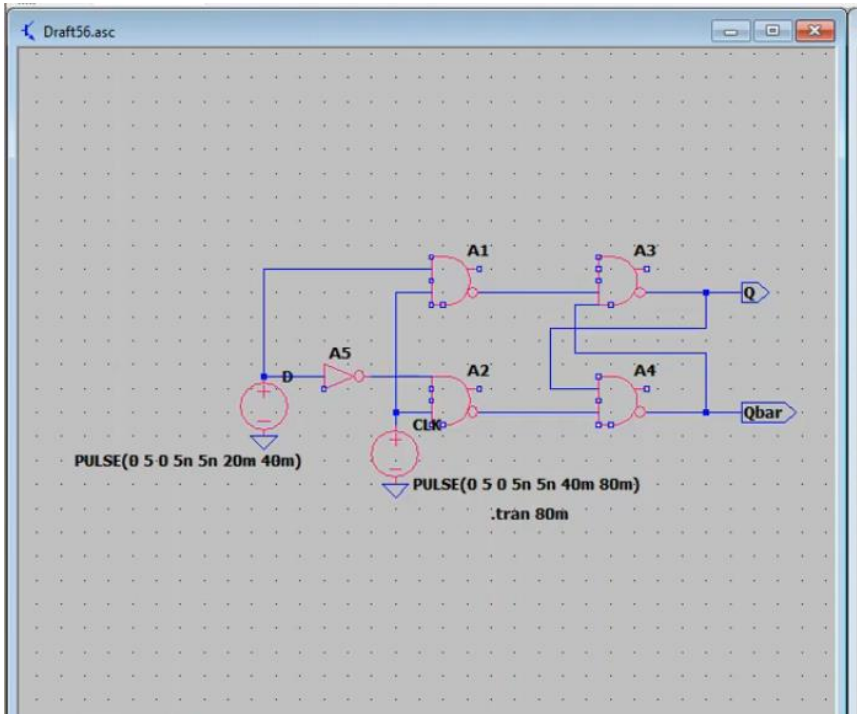

*(b) Negative clipper*

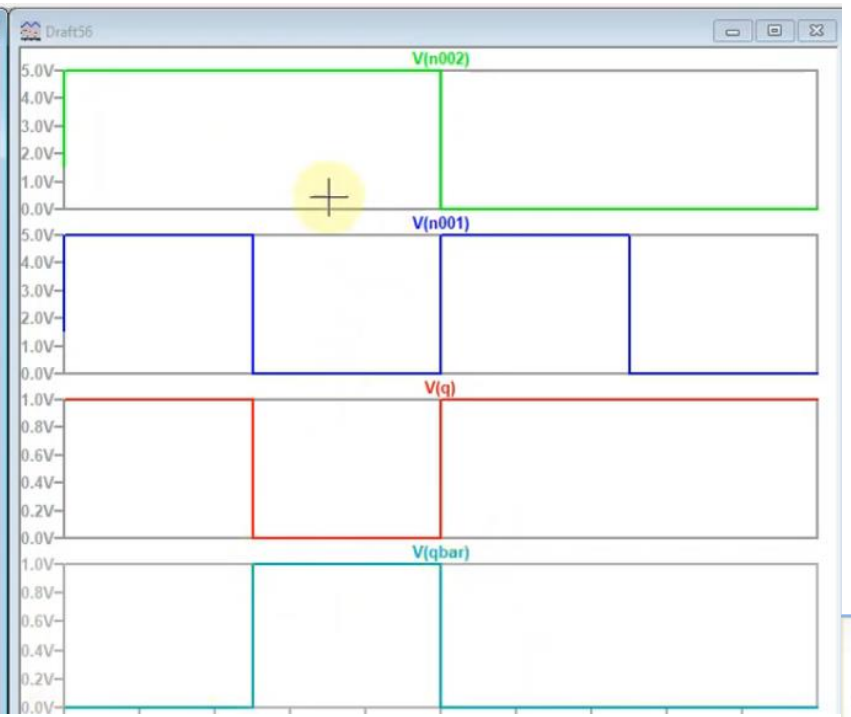
# High Pass Filter simulation in LT-Spice

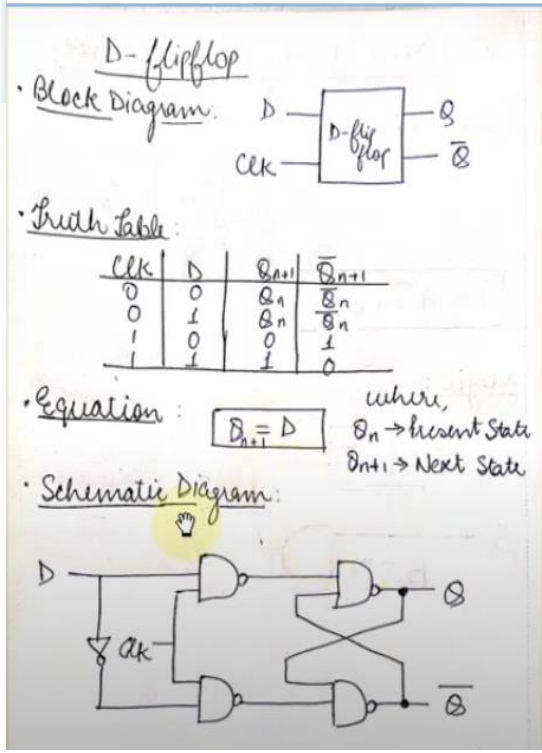


# LT-spice Simulation of D Flip-flop using NAND gates



# IOT – ONLINE SIMLUATOR & VLSI LAYOUT DESGIN

**Continue…..**

# TINKERCAD