Department of Computer Science and Engineering (CSE)

BRAC University

CSE 251: Electronic Devices and Circuits
Fall 2023

Lecture 01:   (i) Course Prologue
(ii) History of Electronics
(iii) Circuit Schematics & Representations

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Course Prologue

Timelines:

Important dates:

- **Sept 23th** (Saturday) Classes of Fall 2023 begin
- **November 3rd** (Friday) Midterm exam (4:30 PM – 6:30 PM)
- **December 24th** (Sunday) Last class of Fall 2023
- **December 26th** (Tuesday) Final exam (4:30 PM –6:30 PM)

Course Prologue

Distribution of Marks:

Assessment	Percentage	Total number of assessments	Number of assessment to be graded
Attendance	was 10%, **now 8%**	-	-
Assignment	was 10%, **now 12%**	3-6	All 3 or [Best (n-1)]
Quiz	15%	4	Best 3 [Best (n-1)]
Midterm	20%	1	1
Final	20%	1	1
Lab	25%	-	-

Course Prologue

Things to remember:

⬦ Quiz questions should help prepare the students for the midterm and final exams.
⬦ Quiz, midterm, and final may contain bonus questions, but that will be at most 10% of the total marks of the assessment.
⬦ Questions for quiz, midterm, and final are often modified versions of assignments

Remember:

⬦ You can collab, but you cannot copy. Plagiarism will result in null marks.

Course Prologue

Absence/Late Policies:

- Attendance will be recorded and shared
- Attendance: P/A/L. You can be 'Excused' if you show documents
- Attendance<70% won't qualify for Mid/Final
- Assignment deadlines won't change; will be set keeping tests in mind
- You can be late for a total of 4 days for assignments

DO NOT:

- Copy/Cheat. If so, negative/capped marks/suspension will be the outcome

Why do we need Electronics?

1. Switches/Logics
2. Arithmetic Operations
3. IC design
4. Chip Design
5. **Computers**
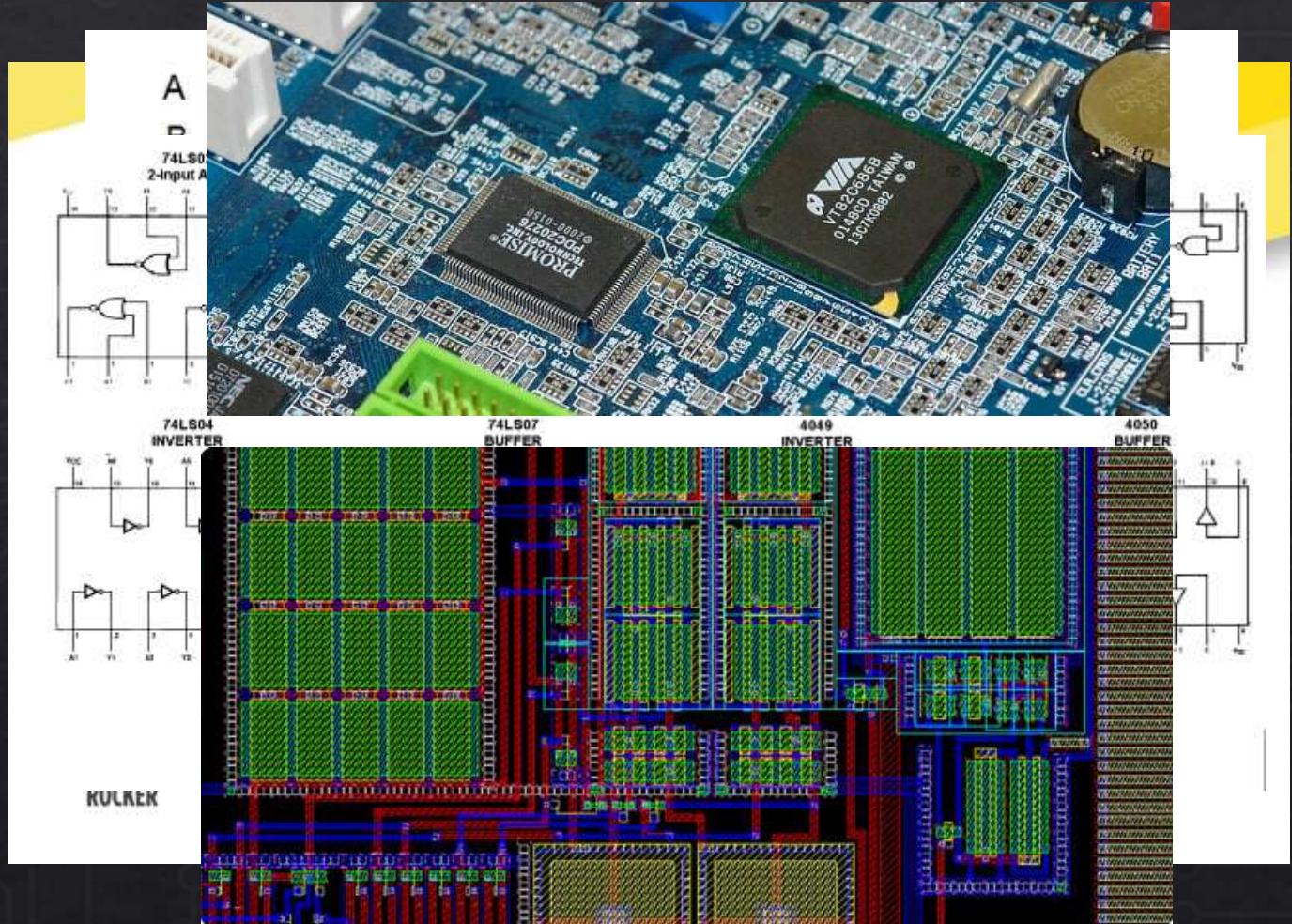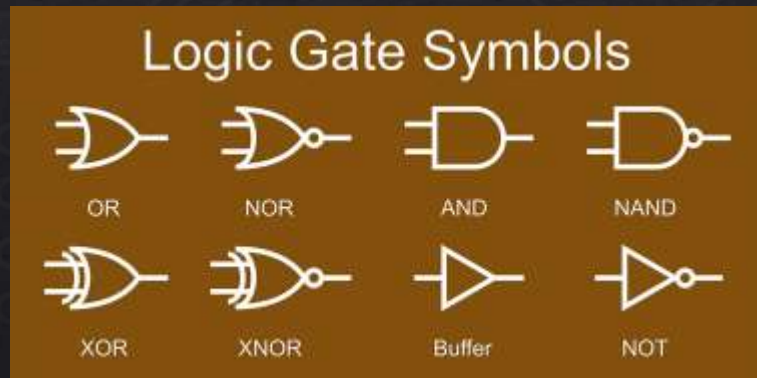
History of Electronics

◇ Electronics emerged with the discovery of the electron in 1897 and the invention of the vacuum tube, which amplified and rectified electrical signals.

◇ Vacuum tubes [Link] were the first active electronic components and revolutionized various industries, including radio, television, telephony, and music recording.

◇ The point-contact [Link] transistor was invented in 1947, marking a significant technological advancement, although vacuum tubes still dominated until the 1980s.

◇ The IBM 608 [Link] calculator in 1955 became the first commercial product to use transistors exclusively, leading to their widespread use in computer logic and peripherals.

◇ The MOSFET [Link], invented in 1959, revolutionized the electronics industry with its compact size, mass production capabilities, low power consumption, and versatility.

◇ The integrated circuit/IC, developed by Jack Kilby and Robert Noyce, solved the problem of circuit size and speed by integrating components onto a single semiconductor block.

◇ This led to advancements in small-scale integration (SSI), medium-scale integration (MSI), and very large-scale integration (VLSI), with billion-transistor processors becoming available in 2008.

Circuit Schematics & Representations

Schematic Symbols for sources:
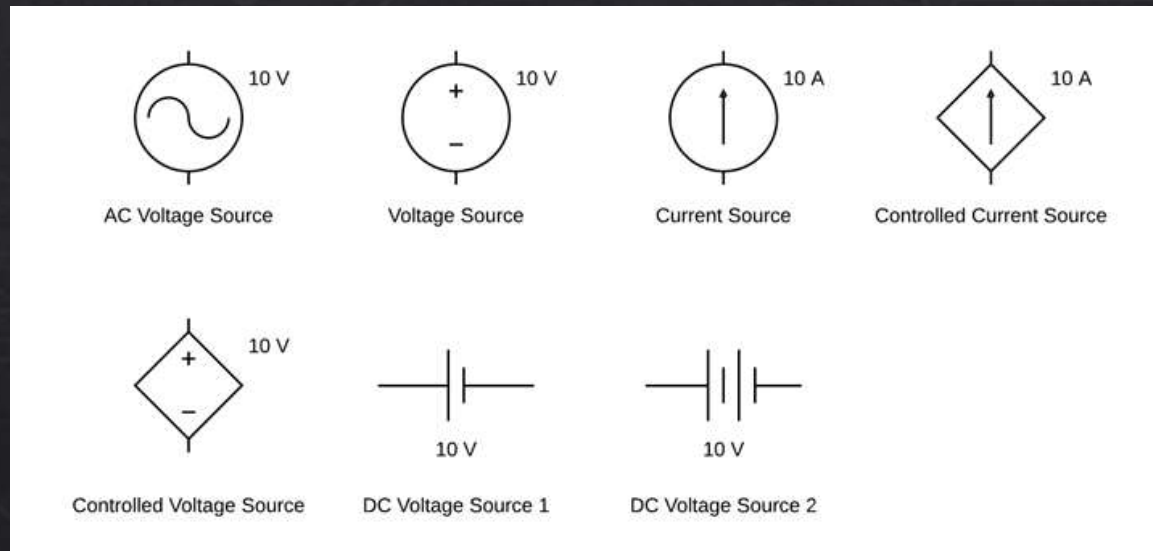
Example 1:
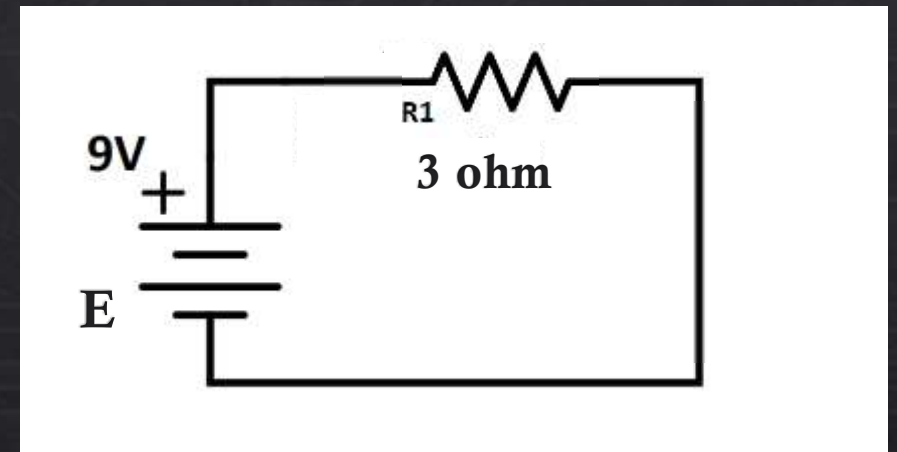
We need to simplify
the circuit representation→ why?

Before we simplify, what would be
this circuit's current?

** How did you get 3 Amps? **

Circuit Schematics & Representations

Simplification Method (*Alternate Representation/Convert to Line Diagram***)**

1) Identify where the *ground* is/Take a *ground* as you find logical.

2) Write the *voltages* along each point of the circuit voltage sources

3) *Detach* the ground from everything

4) Make all the active elements (dc/ac type, voltage/~~current~~ sources) into *single terminals* (arrows/circles) using the voltages you wrote as much as you can [THERE MIGHT BE CASES WHERE YOU CAN'T DO THAT]

5) For passive elements (resistor, capacitor, inductors, etc.), *draw them as they are*

6) Treat the ground as a *single terminal* as well and connect everything to match the main schematic voltages (look at only the passive elements' voltages)

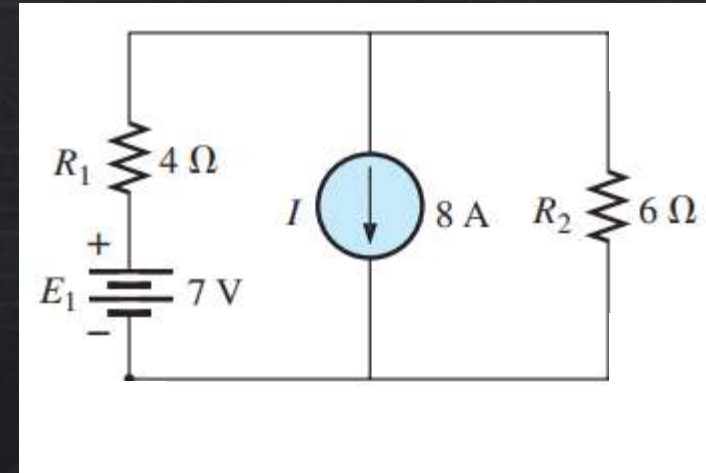What are these
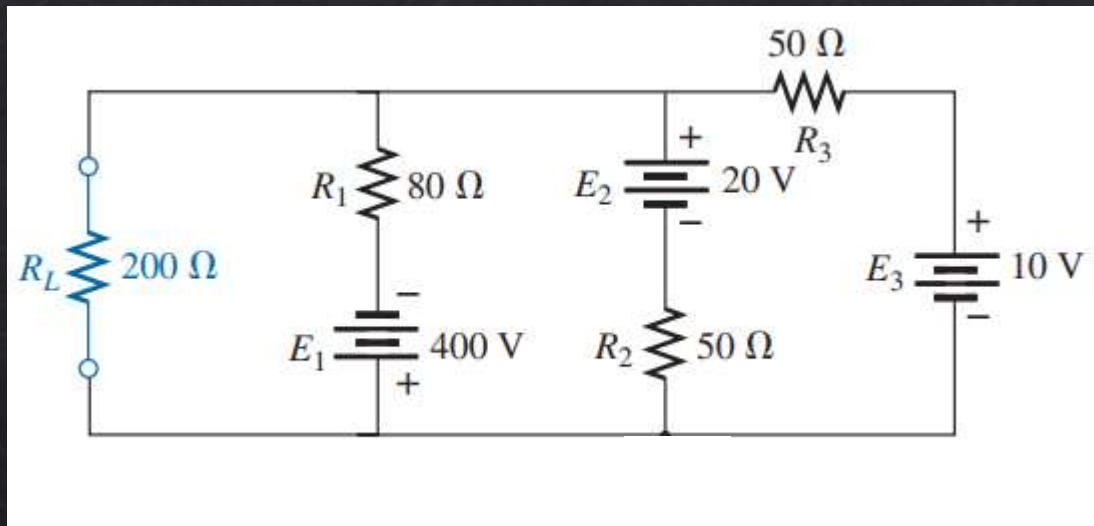'single terminals' called?

More Examples

Difficulty : 2/5
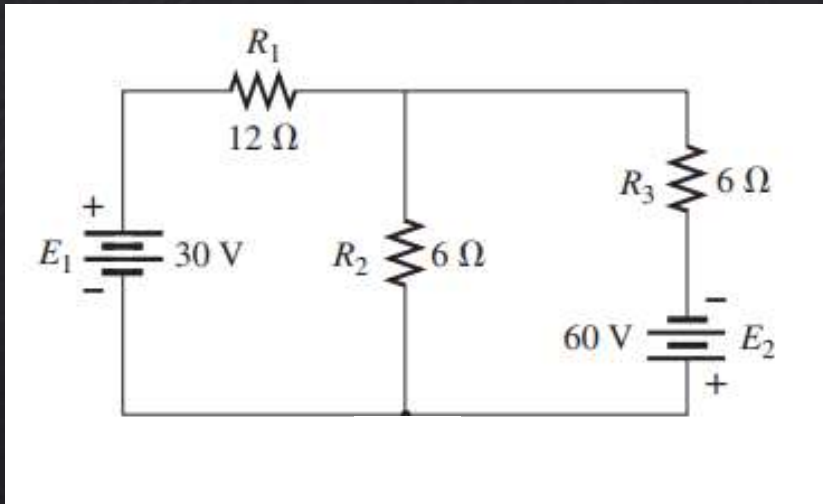
Difficulty : 3/5

Example: 2

Example: 3

More Examples

Difficulty : 4/5

Example: 4

Step – (4) Make all the active elements (dc/ac type, voltage/~~current~~ sources) into single terminals (arrows/circles) using the voltages you wrote as much as you can [*THERE MIGHT BE CASES WHERE YOU CAN'T DO THAT*]

More (Reverse) Examples

Difficulty : 3/5

Convert to Mesh/Loop
Representation