Introduction to Network Analysis

Comprehensive Course on Network Analysis

Ankit Goyal • Lesson 1 • Jan 25, 2021

Syllabus

GATE

1-5 : ECE

1-5+7 : EE

1. Basics of N/W Analysis → 12th physics
2. DC N/W Theorems
3. Transient analysis → 1st order, 2nd order, Laplace → phasor
4. Steady state AC analysis → real & reactive power, resonance, ac network theorems, locos diagram, passive filters
5. 2-port n/w
6. magnetically coupled CKt
7. Graph Theory
8. Three phase circuits → only EE

Strategy

GATE Weightage: 8-12 marks (EE/ECE)

1. Attend all classes ← most important
2. Solve all problems given in class
3. Solve all assignments
4. Solve PYQs with me in special classes
5. after chapter is completed, practice using practice session (tests section of app)
6. attempt Sunday weekly quiz
7. Doubts in class

⑧ always save good problems → lengthy
→ conceptual
→ tricky

⑨ Test series

① Weekly Quizzes

② Subject test : end of subject

③ Mock test : Nov - Dec

INTRODUCTION TO NETWORK ANALYSIS

BASIC DEFINATIONS

1) Charge
2) Current
3) Voltage
4) Power
5) Energy

CHARGE

- The very basic quantity in an electric circuit is charge . Charge is an electrical property of the atomic particles of which matter consists, measured in Coulombs (C) .
- The smallest amount of charge that carried by an electron , equal to -1.602×10^{-19} Coulombs.
- According to the law of conservation of charge states that charge can neither be created nor nor be destroyed , it can be only transfer from one form to another form. Thus the algebraic sum of the electric charges in a system dose not change.

Hydrogen atom

: 1 proton (nucleus)

1 electron

+ e^-

↓

positively charged

(H^+ : ion)

negatively charged

- generally every atom is electrically neutral.

no. of proton = no. of e^-

- +ve charge = -ve charge
- addⁿ of e^-
  ↳ -ve charge
- removal of e^-
  ↳ +ve charge

Conservation of charge

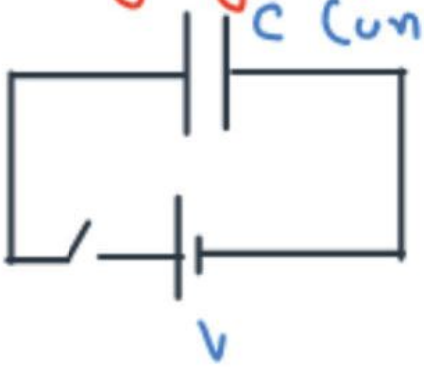
- Charge can neither be created nor be destroyed.

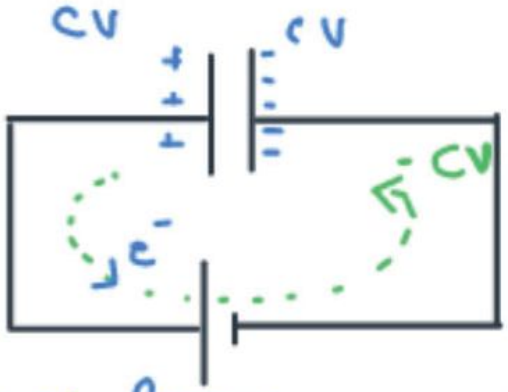
neutral

$10e^-$ A → B

total charge = 0

- charging of cap





net charge = 0

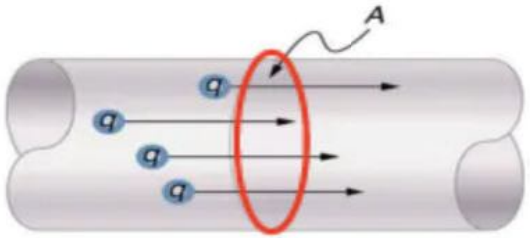
e^- travel from one plate to another

Current

- Electric current is the time rate of change of charge which is measured in amperes(A).

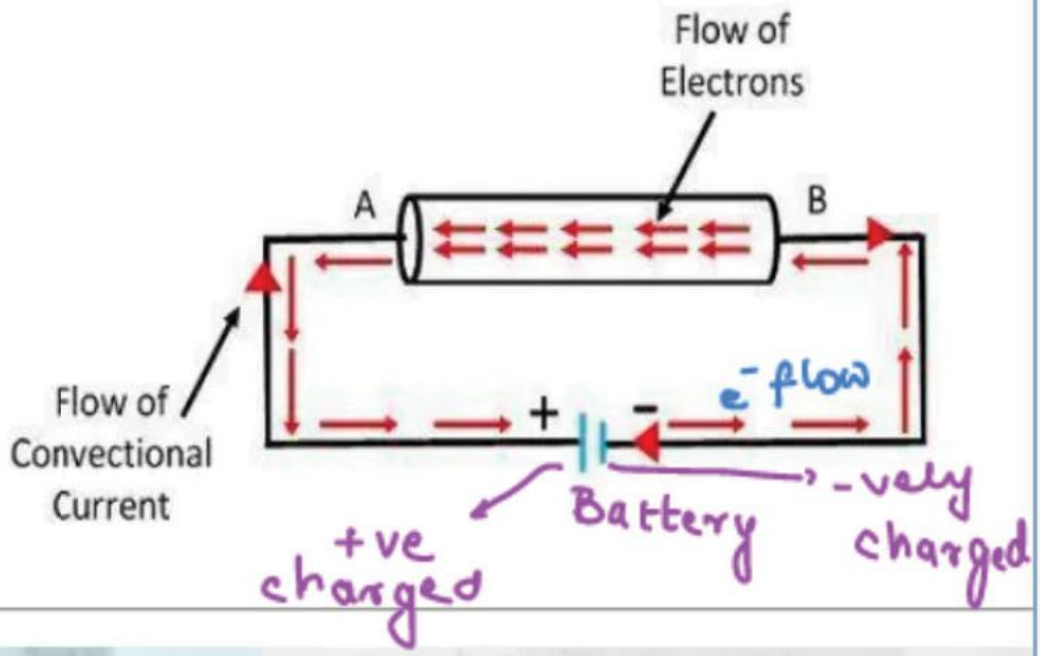
$$i(t) = \frac{dq(t)}{dt}$$

- The net moment of 1 Coulomb (1C) of charge through a cross section of a conductor in 1 second (1S) produces an electric current of 1 amperes (1A).



↳ cross-section

- In network theory while writing KVL and KCL equations conventional current is used.



- Conventional current flows opp. to e^-

Q Why current flow is opposite to e^- flow?

Ans electric current $i = dq/dt$

for electron, $q < 0$

$$i = dq/dt < 0$$

-ve current implies current flows opp. to e^-

Q An electron, neutron & proton are placed in a straight line & are constrained to move along that line. They are left to move. Identify which of them collide first.

Ans

$m_p >> m_e$ $\quad a_e > a_p$

e^- moves faster so e^- collides with neutron.