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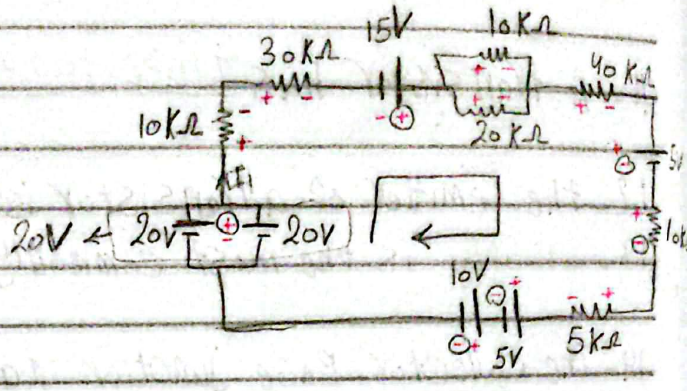
1- Total Voltage = _____



$V_T = 20+15-5-5-10 = 15V$

2- Total resistance = _____

$R_T = 10+30+\frac{10\times20}{10+20}+40+10+5 = 101.67\,K\Omega$

3- Total current = _____

$I = \frac{V}{R} = \frac{15}{101.67\times10^3} = 147.5\times10^{-6} = 148\,\mu A$

4- current in R_2 = _____

$\rightarrow I_{R_2} = 148\,\mu A$

$V=IR$

5- which of the following statements doesn't represent ohm's law?

a) Current/Potential difference = constant → $\frac{I}{V}=\frac{1}{R}$ → $V=IR$ ✓

b) Potential difference/current = constant → $\frac{V}{I}=R$ → $V=IR$ ✓

c) Potential difference = current x resistance → $V=I\times R$ ✓

(d) Current = resistance x Potential difference insulator → $I=R\times V$ ✗

✓6- kirchhoff's voltage law is based on law of conservation of energy

✓7- A diode has one depletion region.

✓8- The most widely used rectifier is bridge full wave rectifier.

✓9- diode characteristic curve is blot between voltage & current.

✓10- smoothing circuit used in amplifiers True.

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11. A transistor has three trimanks.

12. the emitter of a transistor is heavily doped.

13. Silicon is the most commonly semiconductor to manufacture a transistor.

14. The collector-Base junction in a transistor has reverse bais at all times.

15. majority carriers in N-type semiconductor are electrones.

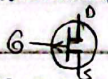
15. majority carriers in P-simeconductor are holes.

16. in PNP semiconductor, the base is n-semiconductor.

17. Bridge full-wave rectifier used to convert ac signals to dc signals.

18. the important mode of transistor is all of the above → active mode, → cut-off mode, → saturation mode

19. Transistor as amplifier can be all of the above.



collector, common, base, emitter

20. Sympol of transistor none of the above.

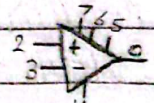
21. The op-amp can amplify both ac and dc signals.

22. A differntial amplifier is a part of an op-amp.

23. An ideal operational amplifier has infinite band width.

24. An operational amplifier contains a differential amplifier, a voltage amplifier, and an output amplifier. True

25. The inverting input is Pin 3. True



26. The ideal output impedance for an operational amplifier is infinite Ω True.

27. Two resistance of 100Ω and zero Ω are connected in Parallel, The overall resistance will be OV.

28. The capacitance C depend on All of the above
the dielectric constant of the material between the Plates. the area of a Plate. the distance between Plates.

29. the unit of inductance is Henery.

30. in a Pure inductive circuit the curren lags behind the voltage by 90°

31. Equivalent Circuit laws for inductors in series and Parallel is similar to that for resistors to that for resistors.

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32- in P-type extrinsic semiconductors, defect are Located above valance band. ✓

33- output Voltage can be limited bigger than 0.7 by diode limiter.

33- outPut Voltage can be limited bigger than 0.7 by diode limiter

34- Silicon Controlled rectifier can be controlled by the gate.

✓35- The β of the transistor is the ratio of Ic and IB True

36- A semiconductor is formed by none of the above bonds.
Co-ordinate Ionic Electrovalent

37- The input Control Parameter of a JFET is _____

38- A crystal diode utilises forward-reverse characterisic for rectification.

39- The current across a PN junction is due to Minority Carriers.

40- A MOSFET has Four terminals
S D G

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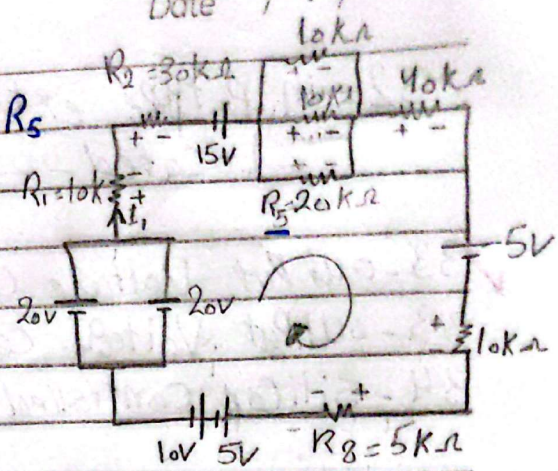
1- using a circuit, find the current in R_5



$\Sigma V = 0$

$-20 + (10\times10^3)I_1 + (30\times10^3)I_1 + (40\times10^3)I_1 - 15$

$(40\times10^3)I_1 + 5 + (10\times10^3)I_1 + (5\times10^3)I_1 + 5 + 10 = 0$

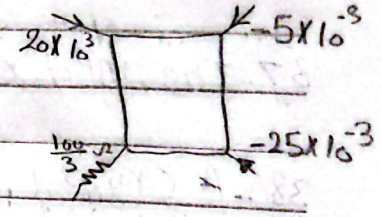
$-15 + (99\times10^3) = 0 \rightarrow I_1 = 1.5\times10^{-4}\ A$

$V = IR = 1.5\times10^{-4}\times4\times10^3 = .6\ V$

$I = \frac{V}{R} = \frac{.6}{20\times10^3} = 3\times10^{-5}\ A$

2- $I_4 = 20\times10^{-3} - 5\times10^{-3} - 25\times10^{-3}$

$I_4 = -10\times10^{-3}\ A$



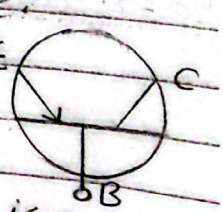
$V = IR = 10\times10^{-3}\times\frac{100}{3} = \frac{1000}{3}\ V$

3- How transistor can be used as amplifier and in which mode:

① Common Base

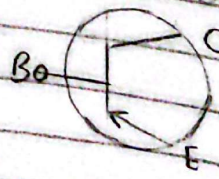
1- emitter is input side and collector is output side.
2- Base is between input and output side.
3- Collector connected to Base reverse.
4- Emitter connected to Base forward.
5- $I_E = I_C + I_B \quad \because I_C \simeq I_E$ → because I_B is small

$I_C = \alpha I_E \rightarrow \alpha = \frac{I_C}{I_E}$



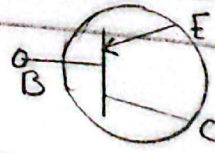
② Common Emitter:

1- we connected input signal between Base and Emitter.
2- we connected output signal between Emitter and collecter.



③ Common collector.

1- we connected input signal between collector and Base.
2- we connected output signal between collector and Emitter.



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4- How does field effect transistor (FET) work?

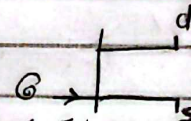
1- Basic structure:

- Source(S): The terminal where current enters the channel.
- Drain(D): The terminal where current exits the channel.
- Gate(G): the terminal that controls the current flowing through the channel.

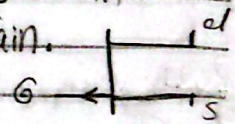
2- types of FETs:

FET
- n-Channel
  - Junction → depletion
  - MOSET → enhancment, depletion
- p-Channel
  - Junction → depletion
  - MOSET → enhancment, depletion

3- Current control:



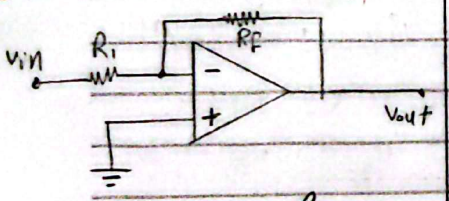
- N-Channel:
  Positive Voltage on gate → Electrones Flow → Current goes from source to drain.
- P-Channel:
  Negative Voltage on gate → holes flow → current goes from source to drain.



5- what is the operational amplifier? Giving 8 applications of it.

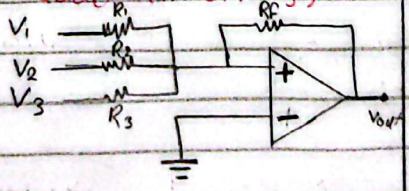
operational amplifier: is an operation to amplify the weak signal.

linear / simple (inverting)



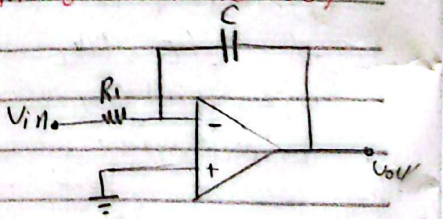
$$V_{out} = \frac{-R_f}{R_1} V_{in}$$

adder (non inverting)



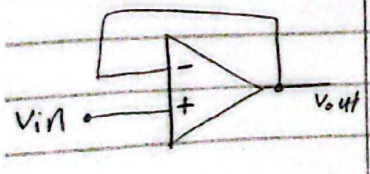
$$V_{out} = -\left(\frac{R_f V_1}{R_1} + \frac{R_f V_2}{R_2} + \frac{R_f V_3}{R_3}\right)$$

integrator (inverting)

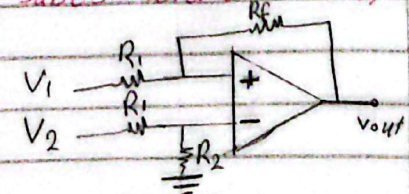


$$V_{out} = \frac{-1}{R_C} \int V_{in}\, dt$$

buffer (inverting)

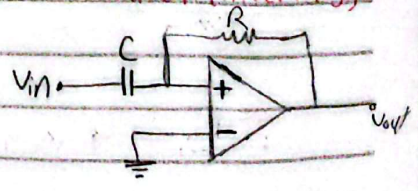


substractor (non inverting)



$$V_{out} = \frac{R_F}{R_1}(V_2 - V_1)$$

differentiator (non inverting)



$$V_{out} = RC\frac{dV_{in}}{dt}$$

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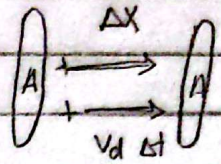
6- Write short note about: ✓✓

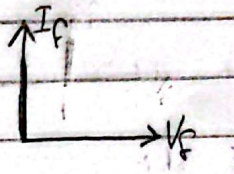
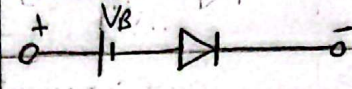
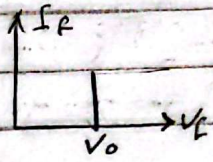
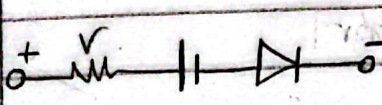
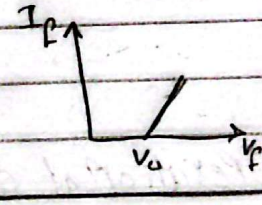
a- Microscopic model of current:

A Current: the amount of charge that run into the tube in one second.

$$I = \frac{Q}{t} = \frac{n.A.x.q}{t} = n.A.\frac{x}{t}.q = n.A.V_d.q$$



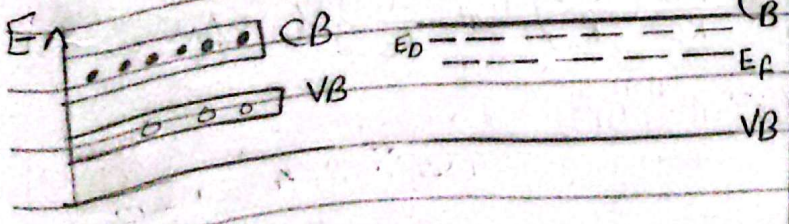
b- Crystal diode Equivalent circuits: ✓✓✓

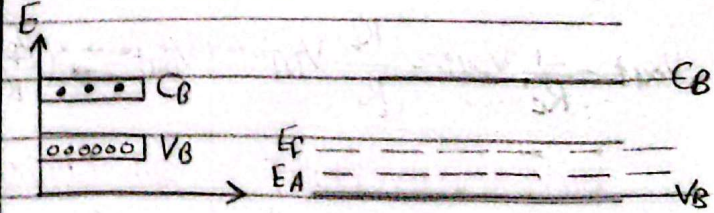
	model	draw	short note
ideal Modal			act close(on) and open(off) switch
semplified model			ideal modal and V called barrier Potential = 0.7 V
APProximate model			semPlified model and a small dynamic resistance

c- Extrinsic semiconductors: semiconductor has been doPed with: ✓✓

1) Pentavalent (Valency 5)
n-type → like: As, Sb, P
- majority carriers: electrones
- miniority carriers: holes

2- Trivalent (Valency 3)
P-type → like: (In), B, Al
- majority carriers: holes
- miniority carriers: electrones





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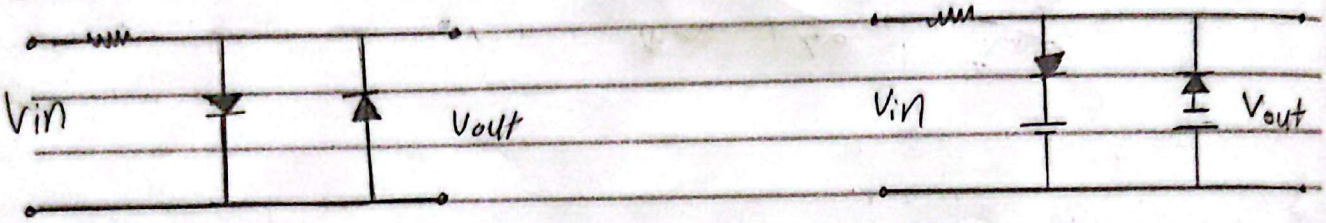
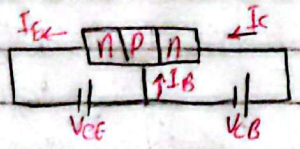
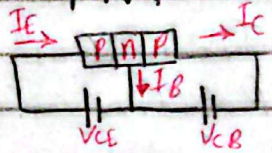
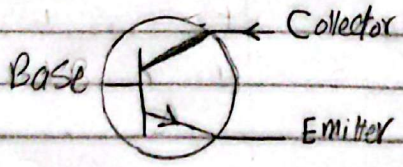
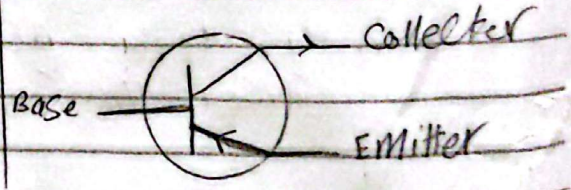
d- Voltage limiter: this device can be limited to a specific value, it should not exceed ±0.7V

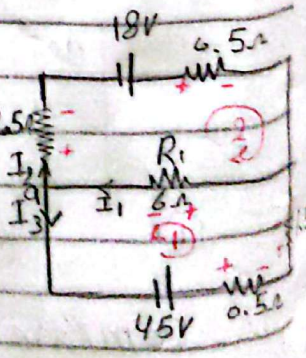
if we want to change this limit → adding a battery



7- Compare between the modes and the configurations of the Bipolar junction transistor ✓

	NPN	PNP
Circuit		
electric circuit		

8- Find the current flowing in the circuit:



in(a) Point → $\sum I = 0$

$\hookrightarrow I_1 - I_2 - I_3 = 0$ ①

in loop (1):

$-45 + 0.5I_3 + 1.5I_3 + 6I_1 = 0$

$\hookrightarrow 6I_1 + 0I_2 + 2I_3 = 45$ ②

in loop (2):

$2.5I_2 - 18 + 0.5I_2 + 6I_1 = 0$

$\hookrightarrow 6I_1 + 3I_2 + 0I_3 = 18$ ③

①,②,③ with Calculator

$I_1 = 4.75\,A \quad I_2 = -3.5\,A \quad I_3 = 8.25\,A$

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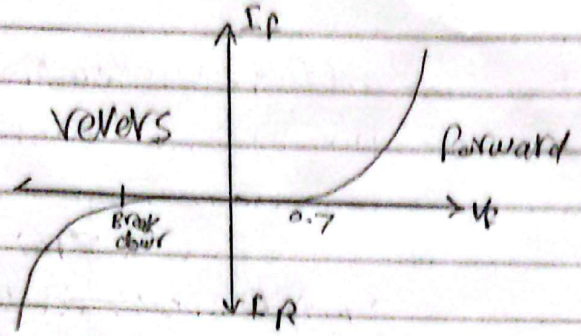
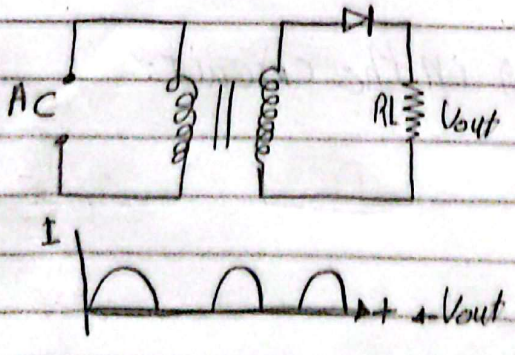
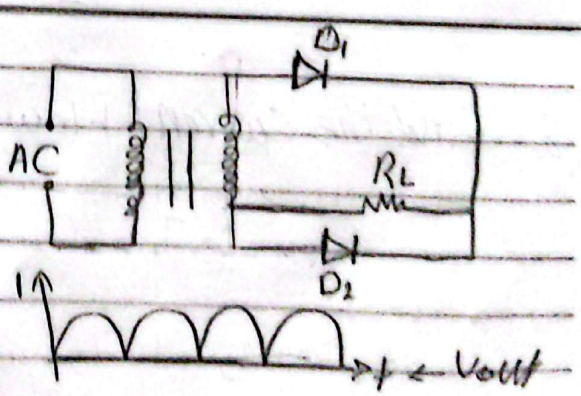
9- write short note about:

b- diode characteristic curve:



C- Rectifiers:

	Half wave rectifier	full wave rectifier
Note short	Contain a diode and RL The current is Pass to half Positive because is a forward base and don't Pass to half negative because is reverse bais.	contain a two diode and RL resistance. The current is Pass a D_1 to Positive direction not Pass a negative direction. the current is Pass a D_2 to negative direction not Pass a positive direction
draw		

10- Compare between the bipolar junction transistor and field effect transistor

BJT → 7 points

FET → 4 points

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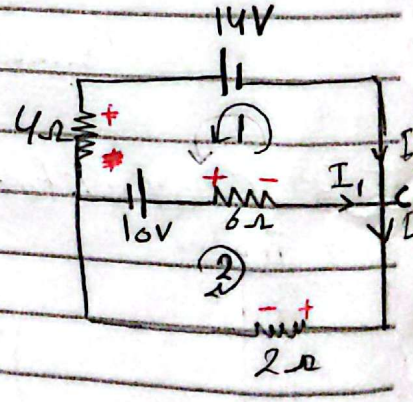
11- Compare between intrinsic and Extrinsic semiconductor:

	intrinsic semiconductor	extrinsic Semiconducted
Carriers	Holes & electrones	N-type → electrones P-type → holes
Number of electrons and holes	equal	N-type → electrones > holes P-type → electrones < holes
impurities	Hasn't	N-type → Pentavalent P-type → trivalent
example	Si, Ge	N-type , P-type

12- find the current in the following circuit



in (C) Point: $\Sigma I = 0$

$$I_1 + I_2 - I_3 = 0 \quad (1)$$

in loop (1):

$$-14 + 4I_2 - 10 + 6I_1 = 0$$

$$6I_1 + 4I_2 + 0I_3 = 24 \quad (2)$$

in loop (2):

$$-10 + 6I_1 + 2I_3 = 0$$

$$6I_1 + 0I_2 + 2I_3 = 10 \quad (3)$$

(1), (2), (3) from Calculator

$I_1 = -0.4\ A$ $I_2 = 6.6\ A$

$I_3 = 6.2\ A$

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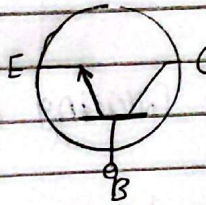
13-(BJT) has three doped regions forming two P-n junctions between them, compare between these regions showing transistor types, characteristic curve, configurations and transistor as an amplifier.

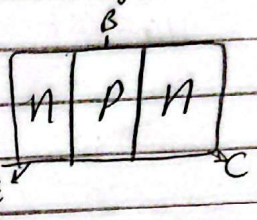
1- different parts of a BJT

- Emitter: the region that emits charge carriers.
- Base: the middle region that controls the current following from the emitter to the collector.
- collector: the region where charge carriers are collected after passing through the Base.

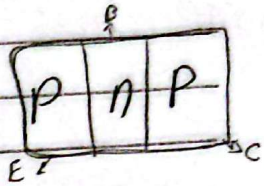


2-types of Transistor:

NPN: Emitter and collector are made of N-type, and the base is P-type.



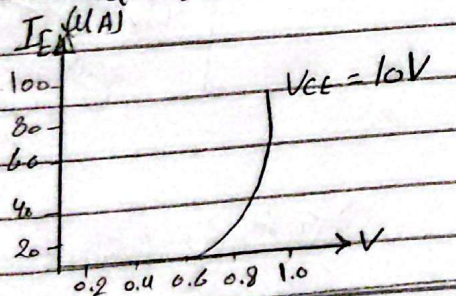
PNP: Emitter and collector are made of P-type, and the base is N-type.

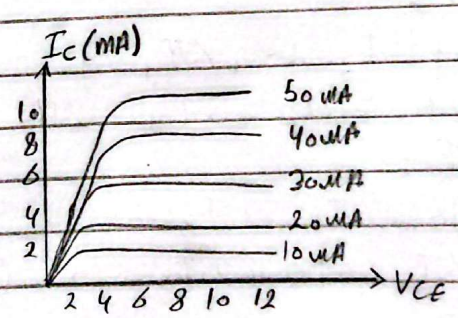


$A_C > A_E > A_B$

$d_E > d_C > d_B$

3- Characteristics curve:

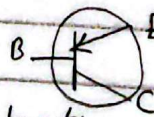




4- Configurations:

1. Common Base: the Base is common between the input and output.

2. Common collector: the collector is common between the input and output.



3. Common emitter: the emitter is common between the input and output

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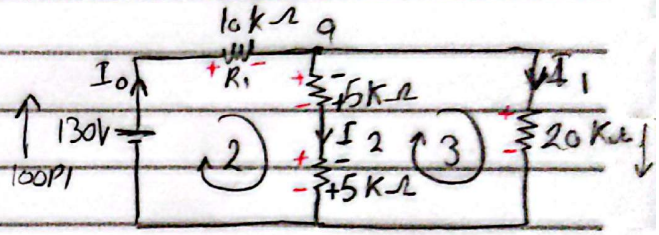
5_transistor as amplifier:

- it amplifies electrical signals by modulating the collector current(I_C) based on the base current I_B.

$$V_{CC} = V_{CE} + I_C R_L \qquad \beta = \frac{I_C}{I_B}$$

14_find the current in current in the flowing circuit applying Kirchhoff's laws:



From @ Point:

$$I_0 - I_1 - I_2 = 0 \quad ①$$

From loop 2:

$$-130 + (10\times10^3)I_0 + (10\times10^3)I_2 = 0 \quad ②$$

From loop 3:

$$(20\times10^3)I_1 + (10\times10^3)I_2 = 0 \quad ③$$

From Calculator 1,2,3

$$I_0 = 4.33\times10^{-3}\ A \quad I_1 = -4.33\times10^{-3}\ A \quad I_2 = 8.6\times10^{-3}\ A$$

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