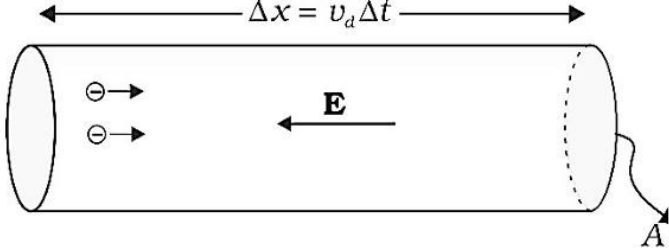
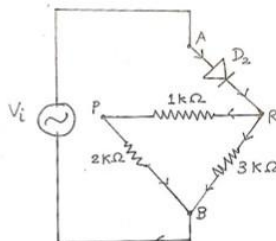
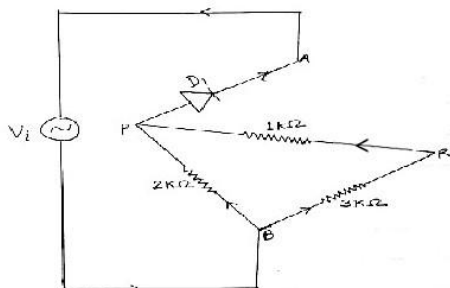


MARKING SCHEME: PHYSICS (042)			
Session: 2025–26			
Code: 55/ 1 /3			
Q. No.	VALUE POINTS/EXPECTED ANSWERS	Marks	Total Marks
	SECTION – A	HOME	
1.	(C) (i), (iii) and (iv) only		1
2.	(C) wavelength is halved and frequency remains unchanged.		1
3.	(C) Diffusion and drift currents are equal and opposite.		1
4.	(B) $\frac{r_2}{r_1}$		1
5.	(C) 135°		1
6.	(A) $0.15 \frac{V}{m}$		1
7.	(D) $u > 2R$		1
8.	(D) - 2		1
9.	(B) Ultraviolet rays		1
10.	(A) $2\pi I$, along + X- axis		1
11.	(D) all these waves		1
12.	(D) 0.60		1
13.	(C) Assertion (A) is true, but reason (R) is false.		1
14.	(D) Both Assertion (A) and (R) Reason are false.		1
15.	(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).		1
16.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	HOME	1
	SECTION – B		
17.	• Writing the order of Magnitude of drift velocity $\frac{1}{2}$ • Deducing the relation between current flowing through a conductor and drift velocity. $1\frac{1}{2}$ • Magnitude of drift velocity in conductor is of the order of a few mm/s  • For n number of free electrons per unit volume in a conductor of cross sectional area A, the total charge transported across the area in time Δt is $Q = - ne A v_d \Delta t$	$\frac{1}{2}$ $\frac{1}{2}$	

	As electron moves in a direction opposite to that of electric field $I \Delta t = ne A v_d \Delta t$ $I = neAv_d$	$\frac{1}{2}$ $\frac{1}{2}$	HOME 2
18.	• Finding the ratio of maximum value of torque 2 Side of square $a = \frac{L}{4N}$ and radius of circular coil $r = \frac{L}{2\pi N}$ $\tau = NIBA$ $\frac{\tau_1}{\tau_2} = \frac{NIBA_1}{NIBA_2}$ $\frac{\tau_1}{\tau_2} = \frac{A_1}{A_2}$ $\frac{\tau_1}{\tau_2} = \frac{(L/4N)^2}{\pi(\frac{L}{2\pi N})^2}$ $\frac{\tau_1}{\tau_2} = \frac{\pi}{4}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2
19.	Finding least distance 2 (a) At the point of coincidence for dark fringes. $d \sin \theta = n\lambda_2 = (n+1)\lambda_1$ $n \times 600 = (n+1) \times 400$ $n = 2$ Position of dark fringe from the central maxima $y = \frac{(n+1)\lambda_1 D}{d}$ $y = \frac{3 \times 400 \times 10^{-9} \times 1.5}{1 \times 10^{-3}}$ $y = 1.8 \text{ mm}$ Alternatively: $y = \frac{n\lambda_2 D}{d}$ $y = \frac{2 \times 600 \times 10^{-9} \times 1.5}{1 \times 10^{-3}}$ $y = 1.8 \text{ mm}$ OR • Finding the least distance 2 (b) At the point of coincidence for bright fringes $\frac{n\lambda_2 D}{d} = \frac{(n+1)\lambda_1 D}{d}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	HOME

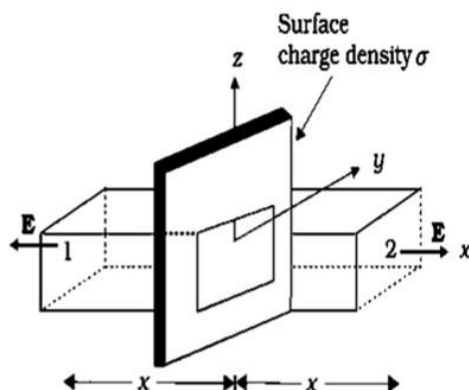
	$n \times 660 = (n + 1) \times 440$ $n = 2$ Position of bright fringe from the central maxima $y = \frac{n\lambda_2 D}{d}$ $y = \frac{2 \times 660 \times 10^{-9} \times 1.5}{0.6 \times 10^{-3}}$ $y = 3.3 \text{ mm}$ Alternatively: $y = \frac{(n + 1)\lambda_1 D}{d}$ $y = 3.3 \text{ mm}$	$\frac{1}{2}$ $\frac{1}{2}$	HOME
20.	Calculating the accelerating voltage 2 de-Broglie wavelength $\lambda = \frac{h}{\sqrt{2meV}}$ $V = \frac{h^2}{2me \times \lambda^2}$ $V = \frac{(6.6 \times 10^{-34})^2}{2 \times 9 \times 10^{-31} \times 1.6 \times 10^{-19} (0.011 \times 10^{-9})^2}$ $V = 12500 \text{ Volts}$	$\frac{1}{2}$ $\frac{1}{2}$	HOME
21.	Calculating the energy released 2 E_{bn} for (A=240) Nucleus = 7.6 MeV E_{bn} for two fragments (A=120) $= 8.5 \text{ MeV}$ Gain in $E_{bn} = 8.5 - 7.6$ $= 0.9 \text{ MeV}$ Total gain in binding energy = 240×0.9 $= 216 \text{ MeV}$ Alternatively: Binding energy for (A=240) nucleus is = $240 \times 7.6 \text{ MeV}$ Binding energy for fragments is = $2 \times 120 \times 8.5$ $= 240 \times 8.5 \text{ MeV}$ Energy released = $240 \times 8.5 - 240 \times 7.6$ $= 240 \times (8.5 - 7.6)$ $= 240 \times 0.9$ $= 216 \text{ MeV}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2

SECTION – C		HOME
22.	(a) Identifying the diode which conducts and justification.1/2 (b) Redrawing the equivalent circuit.1 (c) Calculating the output voltage drop across the three resistors.1/2+1/2+1/2 (a) Diode D₂ is in forward bias and it conducts1/2 (b)  1 (c) Using ohm's law V = IR Voltage drop across RP, PB and RB is V_{RP} = 4V , V_{PB} = 8V , V_{RB} = 12V1/2+1/2+1/2 Alternatively: If the student considers positive AC cycle reaching diode D₁ (a) Diode D₁ is in forward bias and it conducts. (b)  (c) Using Ohm's law V = IR V_{PB} = 12V, V_{PR} = 3V, V_{RB} = 9V	HOME
23.	Calculating the applied potential difference between the plates.3 Since $a = \frac{qE}{m} = \frac{qV}{mL}$ $t = \frac{x}{u_x}$	3

25.

- (a) Deducing an expression for electric field at point due to the uniformly charged infinite plane thin sheet. 2
- (b) Writing the net electric field due to two thin sheets.
- (i) Inside $\frac{1}{2}$
- (ii) Outside $\frac{1}{2}$

(a)

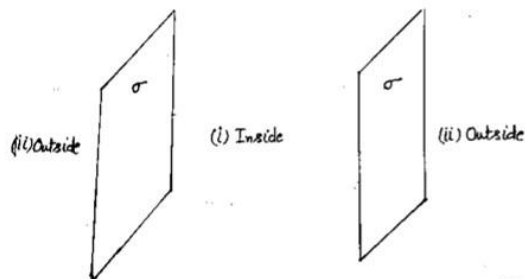


As seen from the figure, only the two faces 1 and 2 will contribute to the flux. Therefore, flux $\vec{E} \cdot \Delta \vec{S}$ through both the surfaces are equal and add up. Therefore, net flux through the Gaussian surface is $2EA$. The charge enclosed by the close surface is σA .

$$2EA = \frac{\sigma A}{\epsilon_0}$$

$$\vec{E} = \frac{\sigma}{2\epsilon_0} \hat{n}$$

(b)

(i) $E_{in} = 0$ (ii) $E_{out} = \frac{\sigma}{\epsilon_0}$

OR

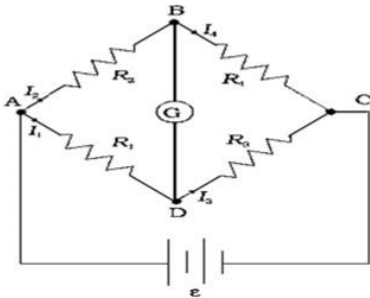
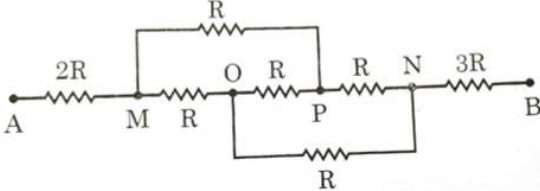
- (a) Obtaining the Condition for balanced Wheatstone bridge. 2
- (b) Finding the net resistance of the given network. 1

HOME

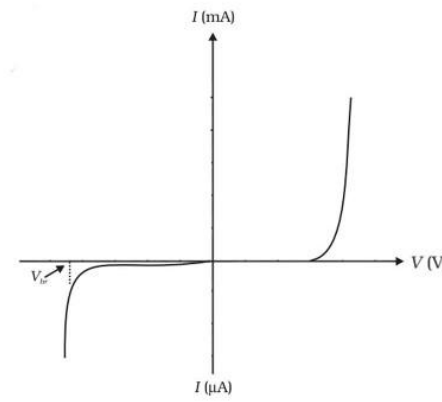
HOME

3

HOME

	(a)  By using Kirchhoff's rule to closed loops ADDBA and CBDC. The first loop gives $-I_1 R_1 + 0 + I_2 R_2 = 0$ ----- (1) $\because [V_B = V_D, I_g = 0]$ Second loop gives $I_4 R_4 + 0 - I_3 R_3 = 0$ $\therefore I_g = 0$, hence $I_1 = I_3$ and $I_2 = I_4$ $I_2 R_4 - I_1 R_3 = 0$ ----- (2) From equations (1) and (2) Hence $\frac{R_2}{R_1} = \frac{R_4}{R_3}$ (b)  Due to balanced Wheatstone bridge $R_{MN} = R$ Total resistance across AB $R_{AB} = R_{AM} + R_{MN} + R_{NB}$ $R_{AB} = 2R + R + 3R$ $R_{AB} = 6R \Omega$	HOME $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ HOME $\frac{1}{2}$ 3							
26.	<table><tr><td>(a) Calculating the capacitance of the capacitor</td><td>1</td></tr><tr><td>(b) Calculating the electric field between the plates of the capacitor</td><td>1</td></tr><tr><td>(c) Calculating the energy stored in the capacitor</td><td>1</td></tr></table> (a) For parallel plate capacitor $C_0 = \frac{\epsilon_0 A}{d}$ If the distance between the plate is doubled and dielectric slab of dielectric constant $K = 1.8$ is introduced. The new capacitance $C = \frac{K\epsilon_0 A}{2d}$	(a) Calculating the capacitance of the capacitor	1	(b) Calculating the electric field between the plates of the capacitor	1	(c) Calculating the energy stored in the capacitor	1	$\frac{1}{2}$	
(a) Calculating the capacitance of the capacitor	1								
(b) Calculating the electric field between the plates of the capacitor	1								
(c) Calculating the energy stored in the capacitor	1								

	$C = \frac{K}{2} C_o$ $C = \frac{1.8}{2} C_o$ $C = 0.9 C_o$ New capacitance decreases (b) $\therefore$ Battery is disconnected, charge on capacitor remains same. New potential on capacitor is $V' = \frac{Q}{C'}$ $V' = \frac{Q}{0.9C_o}$ Electric field between the plates of capacitor $E' = \frac{V'}{d'}$ $E' = \frac{Q}{0.9C \times 2d}$ $E' = \frac{1}{1.8} \frac{Q}{Cd}$ $E' = \frac{E}{1.8}$ Electric field decreases (c) $\therefore$ Energy stored in the capacitor $U = \frac{1}{2} \frac{Q^2}{C}$ $U' = \frac{1}{2} \frac{Q^2}{C'}$ $U' = \frac{1}{2} \frac{Q^2}{(0.9C_o)}$ $U' = \frac{U}{0.9}$ Energy stored increases	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	HOME HOME 3								
27.	<table> <tr> <td>(a) Drawing V-I characteristics of silicon diode.</td> <td>1</td> </tr> <tr> <td>(b) Explanation of</td> <td></td> </tr> <tr> <td>(i) Minority carrier injection in forward bias.</td> <td>1</td> </tr> <tr> <td>(ii) Break down voltage in reverse bias</td> <td>1</td> </tr> </table>	(a) Drawing V-I characteristics of silicon diode.	1	(b) Explanation of		(i) Minority carrier injection in forward bias.	1	(ii) Break down voltage in reverse bias	1		
(a) Drawing V-I characteristics of silicon diode.	1										
(b) Explanation of											
(i) Minority carrier injection in forward bias.	1										
(ii) Break down voltage in reverse bias	1										

	(a)  (b) (i) Due to applied voltage, electrons from n-side cross the depletion region and reach p-side and holes from p-side cross the junction reach the n-side. This process under forward bias is called as minority charge injection. (ii) The current under reverse bias is essentially voltage independent up to a critical reverse bias voltage known as breakdown voltage. Alternatively: The voltage in Reverse bias after which the value of reverse current starts increasing sharply is called breakdown voltage.	HOME 1 1 1 3															
28.	<table border="1" data-bbox="303 994 1287 1196"> <tr> <td>(a)</td> <td>Reason for preference of image formed at infinity</td> <td>$\frac{1}{2}$</td> </tr> <tr> <td>(b)</td> <td>Selecting the lenses for</td> <td></td> </tr> <tr> <td></td> <td>(i) Telescope and</td> <td>1</td> </tr> <tr> <td></td> <td>(ii) Compound microscope</td> <td>1</td> </tr> <tr> <td></td> <td>reason</td> <td>$\frac{1}{2}$</td> </tr> </table> (a) In the case of normal adjustment, the eye muscles remain relaxed while they are strained in the case when image is formed at near point while viewing the object, hence it is preferred. (b) - For Telescope - Lense L_2 is suitable as objective Lens - Lense L_3 is suitable as eyepiece - For Compound microscope - Lense L_3 is suitable as objective lens - Lense L_1 is suitable as eyepiece - Reason - For telescope, objective lens should have large aperture and large focal length - For microscope, objective and eye lens should have moderate aperture but the objective should have large power.	(a)	Reason for preference of image formed at infinity	$\frac{1}{2}$	(b)	Selecting the lenses for			(i) Telescope and	1		(ii) Compound microscope	1		reason	$\frac{1}{2}$	HOME $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 3
(a)	Reason for preference of image formed at infinity	$\frac{1}{2}$															
(b)	Selecting the lenses for																
	(i) Telescope and	1															
	(ii) Compound microscope	1															
	reason	$\frac{1}{2}$															

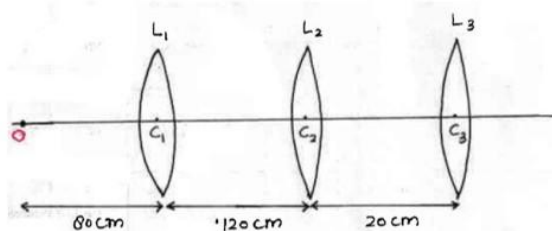
[illegible]

$$\frac{1}{f} = \left(\frac{n_2}{n_1} - 1 \right) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

1/2

HOME

(b)



For lens L_1

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{40} = \frac{1}{v_1} + \frac{1}{80}$$

$$\frac{1}{40} = \frac{1}{v_1} + \frac{1}{80}$$

$$\frac{1}{v_1} = \frac{1}{80}$$

$$v_1 = 80 \text{ cm}$$

For lens L_2

$$u_2 = 120 - 80$$

$$u_2 = 40 \text{ cm}$$

$$\frac{1}{40} = \frac{1}{v_2} + \frac{1}{40}$$

$$\frac{1}{v_2} = 0$$

$$v_2 = \infty$$

For lens L_3

$$u_3 = \infty$$

$$\frac{1}{40} = \frac{1}{v_3} + \frac{1}{\infty}$$

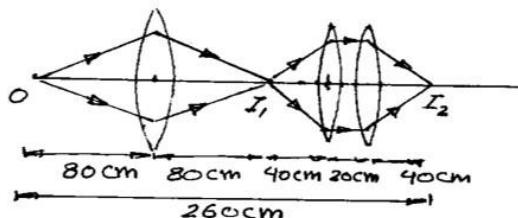
$$v_3 = 40 \text{ cm}$$

Distance between final image and object

$$= 80 + 120 + 20 + 40$$

$$= 260 \text{ cm}$$

Alternatively:



1/2

1/2

1/2

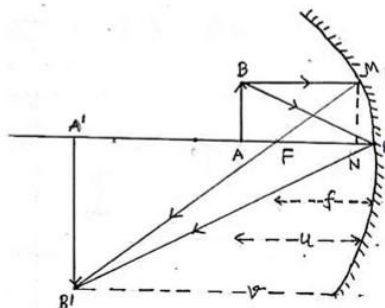
1/2

HOME

HOME

- | | |
|--|---|
| (a) •Drawing ray diagram | 1 |
| •Deriving of mirror formula | 2 |
| (b) Calculating the focal length of mirror | 2 |

(a)



$\triangle BAP$ and $\triangle B'A'P$ are similar then

$$\frac{BA}{B'A'} = \frac{AP}{A'P} \quad \text{-----(1)}$$

$$\therefore BA = MN$$

$\triangle MNF$ and $\triangle B'A'F$ are similar then

$$\frac{MN}{B'A'} = \frac{NF}{A'F}$$

$$\frac{BA}{B'A'} = \frac{NF}{A'F} = \frac{PF}{A'F} \quad (\text{N is very close to P and } BA = MN) \quad \text{-----(2)}$$

From equation (1) and (2)

$$\frac{AP}{A'P} = \frac{PF}{A'F}$$

$$\frac{-u}{-v} = \frac{-f}{-v+f}$$

$$-uv + uf = -vf$$

$$\frac{-uv}{uvf} + \frac{uf}{uvf} = \frac{-vf}{uvf}$$

$$\frac{-1}{f} + \frac{1}{v} = \frac{1}{-u}$$

$$\boxed{\frac{1}{f} = \frac{1}{v} + \frac{1}{u}}$$

Note: Award two marks if student derives mirror formula by using any other justified method

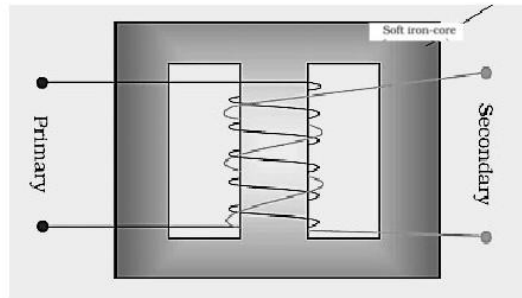
$$(b) m = \frac{-v}{u}$$

$$m = 2$$

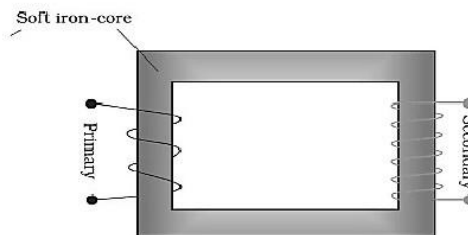
$$\therefore v = -2u \Rightarrow v = -2(-10) = 20 \text{ cm}$$

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

(a) Fig



1

Alternatively:

Principle: When an alternating voltage is applied to the primary, the resulting current produces an alternating magnetic flux which links the secondary and induces an e.m.f in it / mutual induction.

 $\frac{1}{2}$

Let ϕ be the flux in each turn in the core at time t due to current in the primary when a voltage v_p is applied to it. The induce e.m.f in the secondary coil is

$$\varepsilon_s = -N_s \frac{d\phi}{dt} \quad \text{-----(1)}$$

 $\frac{1}{2}$

Alternating flux ϕ also induces an e.m.f. called back e.m.f in the primary. This is

$$\varepsilon_p = -N_p \frac{d\phi}{dt} \quad \text{-----(2)}$$

But

$$\varepsilon_p = v_p$$

If this were not so, the primary current would be infinite since the primary has zero resistance. If the secondary is an open circuit or the current taken from it is small then

$$\varepsilon_s = v_s$$

Now equations (1) and (2) can be written as.

$$\therefore v_s = -N_s \frac{d\phi}{dt} \quad \text{----- (3)}$$

 $\frac{1}{2}$

$$v_p = -N_p \frac{d\phi}{dt} \quad \text{----- (4)}$$

From equations (3) and (4)

 $\frac{1}{2}$

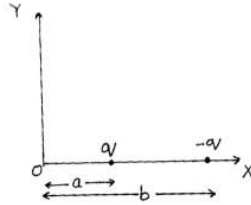
$$\frac{v_s}{v_p} = \frac{N_s}{N_p}$$

If the transformer is ideal the input power is equal to the power output

Since $P = IV$

$$I_p V_p = I_s V_s$$

(b)



$$\therefore \vec{F} = \vec{F}_{+q} + \vec{F}_{-q}$$

$$\text{Net force} = [+q \cdot 2\hat{i} - q \cdot 2\hat{i}]$$

$$= 0 \text{ N}$$

$$\text{Torque } \vec{\tau} = \vec{p} \times \vec{E}$$

$$\vec{\tau} = p(-\hat{i}) \times 2\hat{i}$$

$$\tau = 0$$

Alternatively:

$$\tau = pE \sin \theta$$

Angle between $\vec{p}$ and $\vec{E}$ is π **OR**

(a) Deriving the expression for

- Equivalent e.m.f
- Equivalent internal resistance

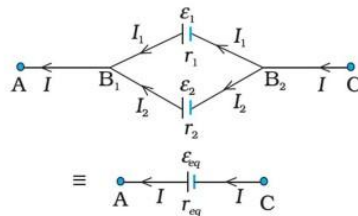
(b) Finding the current through resistance $2R$.

2

1

2

(a)



Let I_1 and I_2 are the currents leaving from the positive electrodes of the cells ε_1 and ε_2 respectively, Hence $I = I_1 + I_2$

Potential difference across the terminals of cell ε_1 is

$$V = \varepsilon_1 - I_1 r_1$$

Potential difference across the terminals of cell ε_2 is

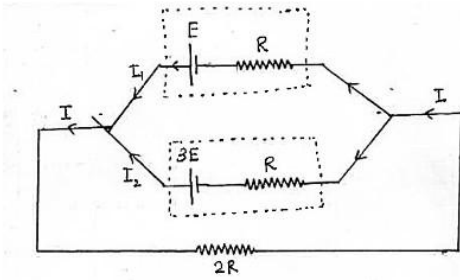
$$V = \varepsilon_2 - I_2 r_2$$

$$I = I_1 + I_2$$

$$I = \frac{\varepsilon_1 - V}{r_1} + \frac{\varepsilon_2 - V}{r_2}$$

 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

HOME

	$I = \left(\frac{\mathcal{E}_1}{r_1} + \frac{\mathcal{E}_2}{r_2} \right) - V \left(\frac{1}{r_1} + \frac{1}{r_2} \right)$ $V = \frac{\mathcal{E}_1 r_2 + \mathcal{E}_2 r_1}{r_1 + r_2} - I \left(\frac{r_1 r_2}{r_1 + r_2} \right)$ $V = \mathcal{E}_{eq} - I r_{eq}$ $\mathcal{E}_{eq} = \left(\frac{\mathcal{E}_1 r_2 + \mathcal{E}_2 r_1}{r_1 + r_2} \right)$ $r_{eq} = \left(\frac{r_1 r_2}{r_1 + r_2} \right)$ (b)  Equivalent emf $E_{eq} = \frac{\mathcal{E}_1 r_2 + \mathcal{E}_2 r_1}{r_1 + r_2}$ $E_{eq} = \frac{E \times R + 3E \times R}{R + R}$ $E_{eq} = \frac{4ER}{2R}$ $E_{eq} = 2E$ Equivalent resistance $r_{eq} = \frac{r_1 r_2}{r_1 + r_2}$ $r_{eq} = \frac{R R}{R + R}$ $r_{eq} = \frac{R}{2}$ $I = \frac{E_{eq}}{2R + \frac{R}{2}}$ $I = \frac{4E}{5R} A$	HOME 1/2 1/2 1 HOME 1/2 1/2 1/2 1/2 5	HOME
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