Key
4/26/10
Conc. Phys
Per X
CKTS #3
1

CONCEPTUAL PHYSICS

CH 35 #19-24

4B-5B

KEY

19. $R_{eq} = R_1 + R_2$

$= 6\Omega + 6\Omega$

$\boxed{R_{eq} = 12\ \Omega}$

20. $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$

$= \frac{1}{6\Omega} + \frac{1}{6\Omega}$

$= \frac{2}{6\Omega}$

$\frac{1}{R_{eq}} = \frac{1}{3\Omega}$

$\boxed{R_{eq} = 3\Omega}$

or $R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$

$= \frac{(6\Omega)(6\Omega)}{6\Omega + 6\Omega}$

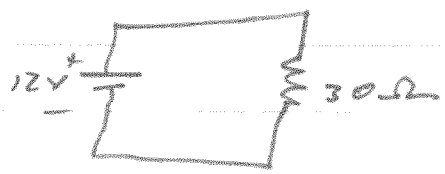
$= \frac{36\Omega^2}{12\Omega}$

$\boxed{R_{eq} = 3\Omega}$

21. $V = IR$; $I = V/R$

$I = \frac{12\ V}{30\Omega}$

$\boxed{I = 0.4\ A}$



22. $R_{eq} = R_1 + R_2 + R_3$

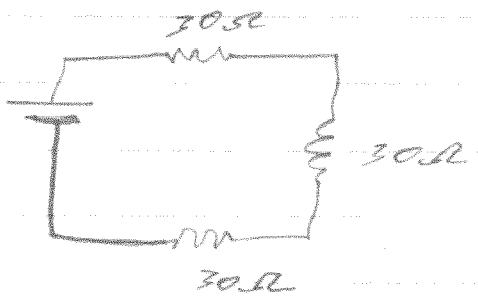
$= 30\Omega + 30\Omega + 30\Omega$

$R_{eq} = 90\Omega$

$V = IR_{eq}$; $I = V/R_{eq}$

$I = \frac{12\ V}{90\Omega}$

$\boxed{I = 0.13\ A}$



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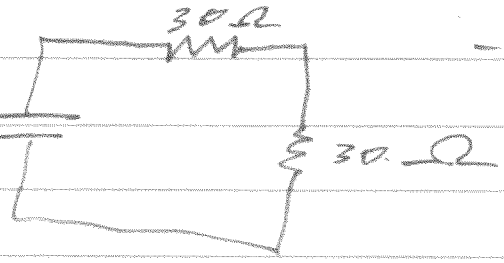
23. $R_{eq} = R_1 + R_2$

$R_{eq} = 30\Omega + 30\Omega$

$R_{eq} = 60\ \Omega$



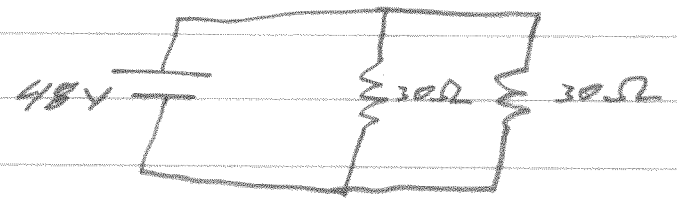
$V = IR$; $I = \frac{V}{R}$

$I = \frac{48\ V}{60\ \Omega}$

$\boxed{I = 0.80\ A}$

24. $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$

$\frac{1}{R_{eq}} = \frac{1}{30\Omega} + \frac{1}{30\Omega}$



$= \frac{2}{30\Omega}$

$\frac{1}{R_{eq}} = \frac{1}{15\Omega}$

$R_{eq} = 15\Omega$

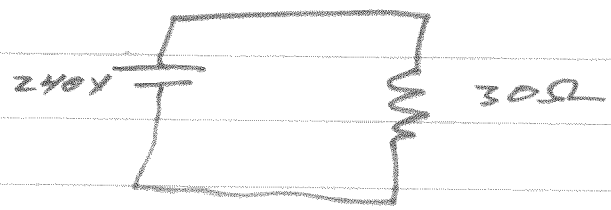
$V = IR$; $I = V/R$

$I = \frac{48V}{15\Omega}$

$\boxed{I = 3.2\ A}$

48. $V = IR$; $I = V/R$

$I = \frac{240V}{30\Omega}$

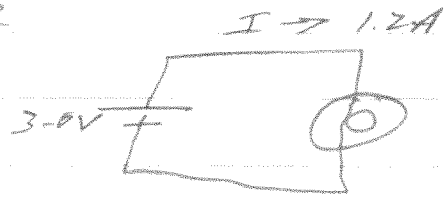


$\boxed{I = 8.0\ A}$

49. $V = IR$; $\frac{V}{I} = R$

$\frac{3.0V}{1.2A} = 2.5\Omega$

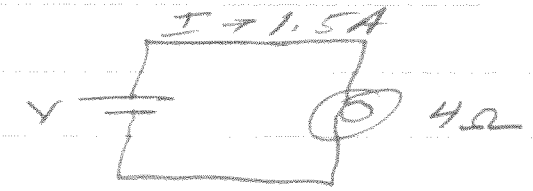
$\boxed{R = 2.5\Omega}$



50. $V = IR$

$V = (1.5A)(4\Omega)$

$\boxed{V = 6.0V}$



51. $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$

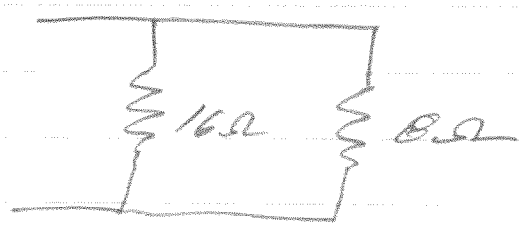
$\frac{1}{R_{eq}} = \frac{1}{16\Omega} + \frac{1}{8\Omega}$

$= \frac{1}{16\Omega} + \frac{2}{16\Omega}$

$\frac{1}{R_{eq}} = \frac{3}{16\Omega}$

$R_{eq} = \frac{16}{3}\Omega$

$\boxed{R_{eq} = 5.33\Omega}$



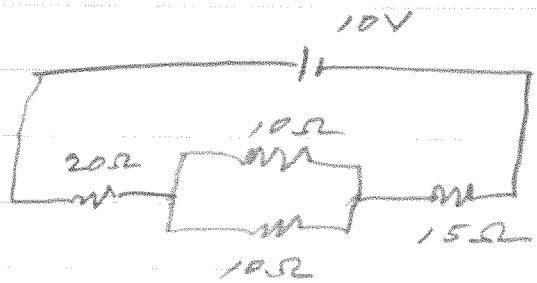
52.

a. // is 2 10Ω resistors

$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$

$= \frac{(10\Omega)(10\Omega)}{10\Omega + 10\Omega}$

$\boxed{R_{eq} = 5\Omega}$



b. $R_{eq} = R_1 + R_2 + R_3$

$R_{eq} = 15\Omega + 5\Omega + 20\Omega$

$\boxed{R_{eq} = 40\Omega}$

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53. How many 4Ω resistors in // = .5Ω R_{eq}?

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \cdots \frac{1}{R_n}$$

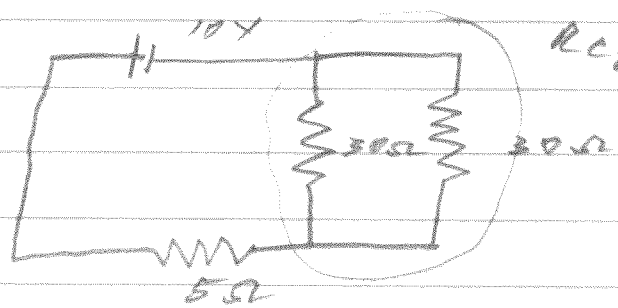
$$\frac{1}{.5\Omega} = n\left(\frac{1}{4\Omega}\right)$$

$$2 = \frac{n}{4\Omega}$$

$$2 \cdot 4\Omega = n$$

$$\boxed{8 = n}$$

54.



Find R_{eq}

$$\frac{1}{R_{eq_1}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{eq_1}} = \frac{1}{20\Omega} + \frac{1}{20\Omega}$$

$$\frac{1}{R_{eq_1}} = \frac{2}{20\Omega}$$

$$R_{eq_1} = 10\Omega$$

$$\rightarrow R_{eq_1} = 15\Omega$$

$$R_{eq_2} = R_{eq_1} + 5\Omega$$

$$= 15\Omega + 5\Omega$$

$$R_{eq_2} = 20\Omega$$

$$V = IR; \quad I = V/R$$

$$I = \frac{10V}{20\Omega}$$

$$\boxed{I = 0.5A}$$

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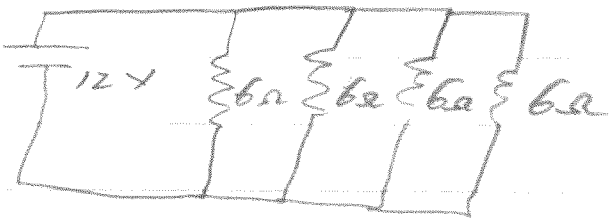
55.

a. $\frac{1}{R_{eq}} = \frac{1}{R_1} + \dots \frac{1}{R_n}$

$\frac{1}{R_{eq}} = 4\left(\frac{1}{6\Omega}\right)$

$\boxed{R_{eq} = 1.5\ \Omega}$



b. $V = IR$; $I = \frac{V}{R}$

$I = \frac{12\ V}{1.5\ \Omega}$

$\boxed{I = 8.0\ A}$

56. 4 w bulb; 30 day month

120 V outlet

a. $P = IV$; $I = \frac{P}{V}$

$I = \frac{4\ w}{120\ V}$

$\boxed{I = .03\ A \text{ or } 30\ mA}$

b. $V = IR$; $R = \frac{V}{I}$

$R = \frac{120\ V}{.03\ A}$

$\boxed{R = 4\ k\Omega \text{ or } 4\ k\Omega}$

c. Energy in month

$4\ w \cdot \frac{1\ kw}{1000\ w} \cdot 30\ d \cdot \frac{24\ hr}{1\ d} = \boxed{2.88\ kwh}$

d. cost = r·t

$= \frac{\$.10}{kwh} \cdot 2.88\ kwh$

$\boxed{cost = \$.29}$

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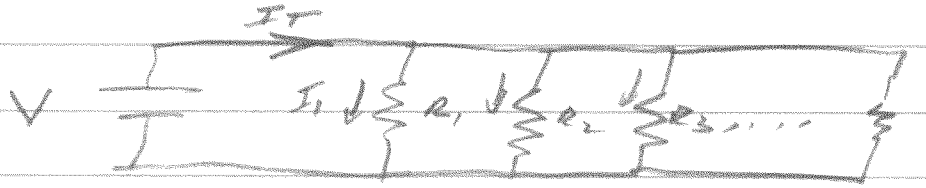
57. Prove $\frac{1}{R_{eq}} = \frac{1}{R_1} + \cdots \frac{1}{R_n}$ — 6 —



$I_T = \sum_1^n I_n \quad (I_1 + I_2 \cdots I_n)$

$I_n = \frac{V}{R_n}$ // Voltage is same

$I_T = \sum_1^n \frac{V}{R_n} \quad \left(\frac{V}{R_1} + \frac{V}{R_2} \cdots \frac{V}{R_n}\right)$

$I_T = V\left(\frac{1}{R_1} + \frac{1}{R_2} + \cdots \frac{1}{R_n}\right)$

$I_T = \frac{V}{R_{eq}} \quad (V = IR)$

$\frac{V}{R_{eq}} = V\left(\frac{1}{R_1} + \cdots \frac{1}{R_n}\right)$

$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots \frac{1}{R_n}$

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58. show R_{eq}

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{eq}} = \frac{R_2}{R_1 R_2} + \frac{R_1}{R_1 R_2}$$ common denominator

$$\frac{1}{R_{eq}} = \frac{R_1 + R_2}{R_1 R_2}$$ simplify

$$\boxed{R_{eq} = \frac{R_1 R_2}{R_1 + R_2}}$$ Invert