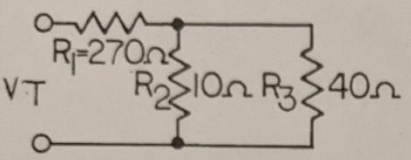
Cayce Beames
Sept 29, 2019
MECH-0010
Professor Gillette

WORKSHEET

COMBINATION CIRCUIT ANALYSIS

Solve the following circuit problems. Be certain to show work and record your answer in the answer box.



1. Find the total resistance in the above circuit.

Show work

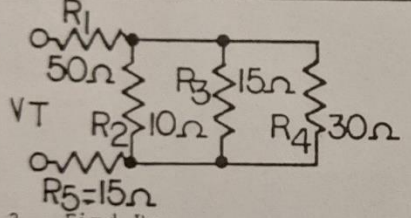
$R_T = R_1 + \left(\frac{R_2 \times R_3}{R_2 + R_3}\right)$

$= 27\Omega + \left(\frac{400}{50}\right)$

$= 27\Omega + 8\Omega$

$= \boxed{278\Omega}$

1. 278Ω



2. Find R_T

Show work

$R_T = 50\Omega + \left(\frac{1}{\frac{1}{10}+\frac{1}{15}+\frac{1}{30}}\right) + 15\Omega$

$= 50 + \left(\frac{1}{\frac{3}{30}+\frac{2}{30}+\frac{1}{30}}\right) + 15\Omega$

$= 50 + \left(\frac{1}{\frac{6}{30}}\right) + 15$

$= 50 + \left(\frac{1}{1} \cdot \frac{5}{1}\right) + 15$

$= 50 + 5 + 15$

$= \boxed{70\Omega}$

2. 70Ω

3A. Draw a combination circuit which contains the following resistors; a 39 ohm and 27 ohm connected in series with two parallel resistors each having a value of 33 ohms.

3B. Find the total resistance of the circuit.

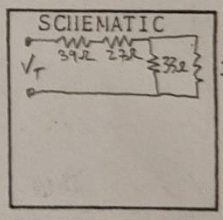
Show work

$R_T = 39 + 27 + \left(\frac{33}{2}\right)$

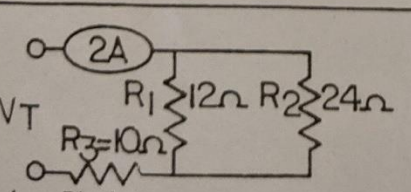
$= 66 + 16.5$

$= 82.5\Omega$

3A.



3B. 82.5Ω



4. Find R_T
5. Find V_T

Show work

$R_T = 10 + \left(\frac{12 \cdot 24}{12+24}\right)$

$= 10 + \left(\frac{288}{36}\right)$

$= 10 + 8$

$= \boxed{18\Omega}$

$V_T = 2A \cdot 18\Omega$

$= \boxed{36V}$

4. 18Ω
5. 36V

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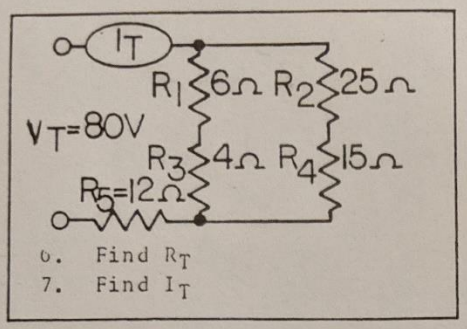


6. Find R_T
7. Find I_T

Show work

$R_T = (6+4) \times (25+15) / ((6+4)+(25+15)) + 12$

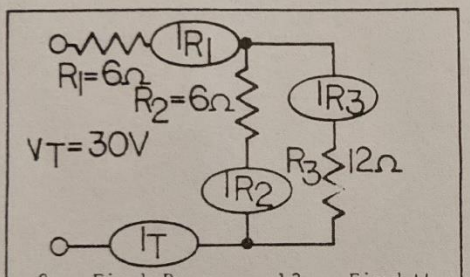
$= 10 \times 40 / 50 + 12$

$= 400/50 + 12$

$= 8 + 12 = \boxed{20\Omega}$

$I_T = 80V / 20\Omega = \boxed{4A}$

6. 20Ω
7. 4A



8. Find R_T
9. Find I_T
10. Find I_{R_1}
11. Find V_{R_1}
12. Find V_{R_2}
13. Find I_{R_2}
14. Find V_{R_3}
15. Find I_{R_3}

Show work

$R_T = 6 + (6 \times 12)/(6+12)$

$= 6 + 72/18$

$= 6 + 4 = \boxed{10\Omega}$

$I_T = 30V / 10\Omega = \boxed{3A}$

$I_{R_1} = \boxed{3A}$

$V_{R_1} = 3A \cdot 6\Omega = \boxed{18V}$

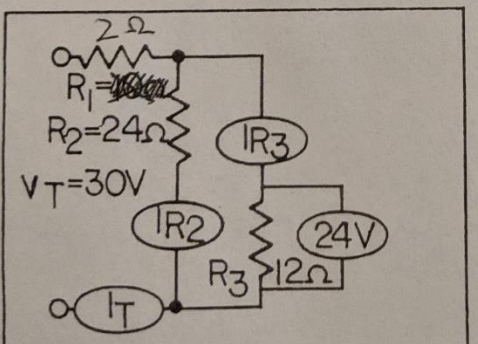
$V_{R_2} = 30V - 18V = \boxed{12V}$

$I_{R_2} = 12V / 6\Omega = \boxed{2A}$

$V_{R_3} = 30V - 18V = \boxed{12V}$

$I_{R_3} = 12V / 12\Omega = \boxed{1A}$

8. 10Ω
9. 3A
10. 3A
11. 18V
12. 12V
13. 2A
14. 12V
15. 1A



16. Find V_{R_1}
17. Find I_{R_3}
18. Find I_{R_2}
19. Find I_T
20. Find I_{R_1}

Show work

$V_{R_1} = 30V - 24V = \boxed{6V}$

$I_{R_3} = 24V / 12\Omega = \boxed{2A}$

$I_{R_2} = 24V / 24\Omega = \boxed{1A}$

$I_T = 2A + 1A = \boxed{3A}$

$I_{R_1} = 6V / 2\Omega = \boxed{3A}$

16. 6V
17. 2A
18. 1A
19. 3A
20. 3A

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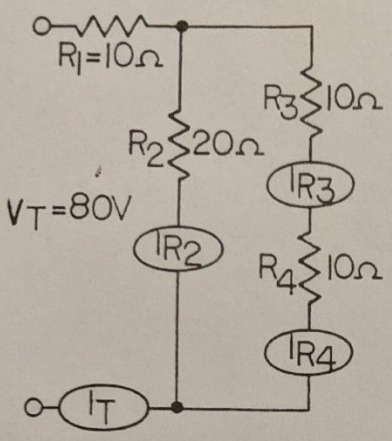

21. Find R_T
22. Find I_T
23. Find V_{R_1}
24. Find V_{R_2}
25. Find I_{R_2}
26. Find I_{R_3}
27. Find I_{R_4}
28. Find V_{R_3}
29. Find V_{R_4}

Show work

$R_T = 10 + \left(\frac{20 \times (10+10)}{20+(10+10)}\right)$

$= 10 + \left(\frac{20 \times 20}{20+20}\right)$

$= 10 + \frac{400}{40}$

$= 10 + 10 = \boxed{20\Omega}$

$I_T = \frac{80V}{20\Omega} = \boxed{4A}$

$V_{R_1} = 4A \cdot 10\Omega = \boxed{40V}$

$V_{R_2} = 80V - 40V = \boxed{40V}$

$I_{R_2} = \frac{40V}{20\Omega} = \boxed{2A}$

$I_{R_3} = \frac{40V}{20\Omega} = \boxed{2A}$

$I_{R_4} = \frac{40V}{20\Omega} = \boxed{2A}$

$V_{R_3} = 2A \cdot 10\Omega = \boxed{20V}$

$V_{R_4} = 2A \cdot 10\Omega = \boxed{20V}$

21. $\boxed{20\Omega}$
22. $\boxed{4A}$
23. $\boxed{40V}$
24. $\boxed{40V}$
25. $\boxed{2A}$
26. $\boxed{2A}$
27. $\boxed{2A}$
28. $\boxed{20V}$
29. $\boxed{20V}$