

**ELECTROTECHNOLOGY  
ELTK1100  
ASSIGNMENT #5  
(SOLUTIONS)**

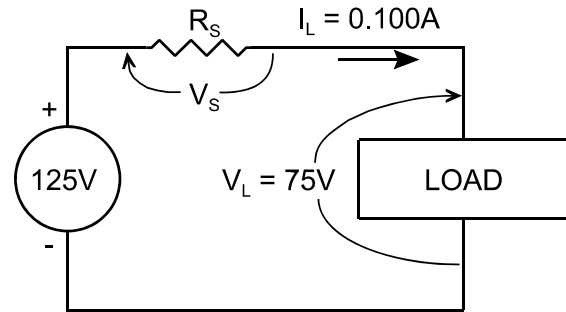
1.

$$I_T = 0.100A \quad ^1$$

$$V_S = V_T - V_L = 125V - 75V = 50V \quad ^2$$

$$R_S = \frac{V_S}{I_T} = \frac{50V}{0.100A} = 500\Omega \quad ^3$$

$$P_S = V_S I_T = 50V * 0.100A = 5W \quad ^4$$



	P (W)	V (V)	I (mA)	R ( $\Omega$ )
<b>T</b>		<b>125</b>	100	
<b>S</b>	$5^4$	$50^2$	$100^1$	$500^3$
<b>LOAD</b>		<b>75</b>	<b>100</b>	

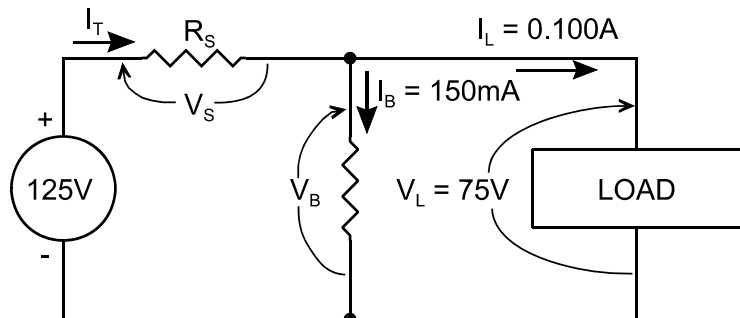
2.

$$I_B = 150mA \quad ^1$$

$$V_B = V_L = 75V \quad ^2$$

$$R_B = \frac{V_B}{I_B} = \frac{75V}{150mA} = 500\Omega \quad ^3$$

$$P_B = V_B I_B = 75V * 150mA = 11.25W \quad ^4$$



$$I_T = I_B + I_L = 150mA + 100mA = 250mA \quad ^5$$

$$V_S = V_T - V_B = 125V - 75V = 50V \quad ^6$$

$$R_S = \frac{V_S}{I_T} = \frac{50V}{250mA} = 200\Omega \quad ^7$$

$$P_S = V_S I_T = 50V * 250mA = 12.5W \quad ^8$$

	P (W)	V (V)	I (mA)	R ( $\Omega$ )
<b>T</b>		<b>125</b>	250	
<b>S</b>	$12.5^8$	$50^6$	$250^5$	$200^7$
<b>LOAD</b>		<b>75</b>	<b>100</b>	
<b>B</b>	$11.25^4$	$75^2$	$150^1$	$500^3$

3. This is a problem exercising the series/parallel rules. Note: this is not a Design problem and you must just determine the unknowns.

(a)

$$V_{LOAD3} = I_{LOAD3} R_{LOAD3} = 40\text{mA} * 1.6\text{k}\Omega = 64\text{V} \quad 1$$

$$V_S = I_T R_S = 72\text{mA} * 500\Omega = 36\text{V} \quad 2$$

$$V_T = V_S + V_{LOAD3} = 36\text{V} + 64\text{V} = 100\text{V} \quad 3$$

(b)

$$R_{LOAD1} = \frac{V_{LOAD1}}{I_{LOAD1}} = \frac{24\text{V}}{8\text{mA}} = 3\text{k}\Omega \quad 4$$

$$R_{LOAD2} = \frac{V_{LOAD2}}{I_{LOAD2}} = \frac{42\text{V}}{12\text{mA}} = 3.5\text{k}\Omega \quad 5$$

	P (W)	V (V)	I (mA)	R ( $\Omega$ )
T		100 <sup>3</sup>	72	
S		36 <sup>2</sup>	72	500
LOAD 3		64 <sup>1</sup>	40	1.6k
2		22 <sup>7</sup>	32 <sup>6</sup>	687.5 <sup>8</sup>
LOAD 2		42	12	3.5k <sup>5</sup>
1		18 <sup>10</sup>	20 <sup>9</sup>	900 <sup>11</sup>
LOAD 1		24	8	3k <sup>4</sup>
B		24 <sup>13</sup>	12 <sup>12</sup>	2k <sup>14</sup>

(c)

$$I_{R_2} = I_T - I_{LOAD3} = 72\text{mA} - 40\text{mA} = 32\text{mA} \quad 6$$

$$V_{R_2} = V_{LOAD3} - V_{LOAD2} = 64\text{V} - 42\text{V} = 22\text{V} \quad 7$$

$$R_2 = \frac{V_{R_2}}{I_{R_2}} = \frac{22\text{V}}{32\text{mA}} = 687.5\Omega \quad 8$$

$$I_{R_1} = I_{R_2} - I_{LOAD2} = 32\text{mA} - 12\text{mA} = 20\text{mA} \quad 9$$

$$V_{R_1} = V_{LOAD2} - V_{LOAD1} = 42\text{V} - 24\text{V} = 18\text{V} \quad 10$$

$$R_1 = \frac{V_{R_1}}{I_{R_1}} = \frac{18\text{V}}{20\text{mA}} = 900\Omega \quad 11$$

$$I_B = I_{R_1} - I_{LOAD1} = 20\text{mA} - 8\text{mA} = 12\text{mA} \quad 12$$

$$V_B = V_{LOAD1} = 24\text{V} \quad 13$$

$$R_B = \frac{V_B}{I_B} = \frac{24\text{V}}{12\text{mA}} = 2\text{k}\Omega \quad 14$$

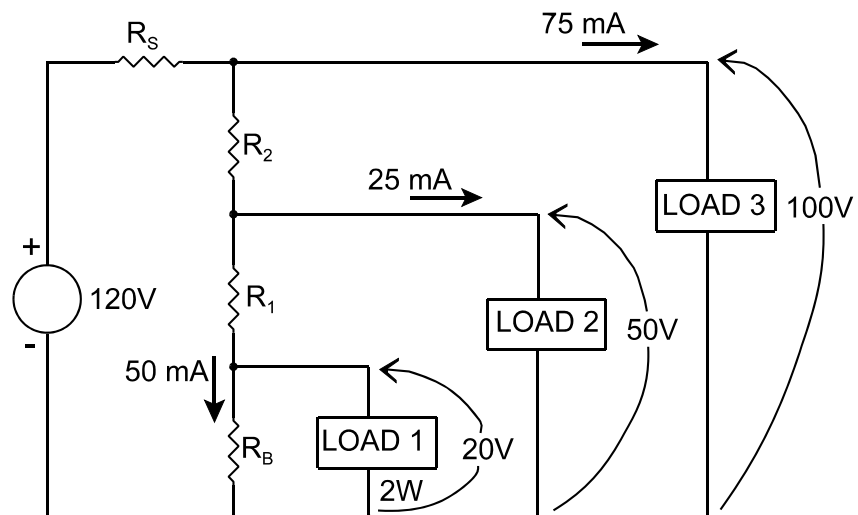
4.

$$I_B = 50\text{mA} \quad 1$$

$$V_B = V_{L1} = 20\text{V} \quad 2$$

$$R_B = \frac{V_B}{I_B} = \frac{20\text{V}}{50\text{mA}} = 400\Omega \quad 3$$

$$P_B = V_B I_B = 20\text{V} * 50\text{mA} = 1\text{W} \quad 4$$



$$I_{L1} = \frac{P_{L1}}{V_{L1}} = \frac{2W}{20V} = 100mA \quad 5$$

$$I_{R1} = I_B + I_{L1} = 50mA + 100mA = 150mA \quad 6$$

$$V_{R1} = V_{L2} - V_{L1} = 50V - 20V = 30V \quad 7$$

$$R_1 = \frac{V_{R1}}{I_{R1}} = \frac{30V}{150mA} = 200\Omega \quad 8$$

$$P_{R1} = V_{R1} I_{R1} = 30V * 150mA = 4.5W \quad 9$$

$$I_{R2} = I_{R1} + I_{L2} = 150mA + 25mA = 175mA \quad 10$$

$$V_{R2} = V_{L2} - V_{L1} = 100V - 50V = 50V \quad 11$$

$$R_2 = \frac{V_{R2}}{I_{R2}} = \frac{50V}{175mA} = 286\Omega \quad 12$$

$$P_{R2} = V_{R2} I_{R2} = 50V * 175mA = 8.75W \quad 13$$

$$I_T = I_{R2} + I_{L3} = 175mA + 75mA = 250mA \quad 14$$

$$V_S = V_T - V_{L3} = 120V - 100V = 20V \quad 15$$

$$R_S = \frac{V_S}{I_T} = \frac{20V}{250mA} = 80\Omega \quad 16$$

$$P_S = V_S I_T = 20V * 250mA = 5W \quad 17$$

	P (W)	V (V)	I (mA)	R ( $\Omega$ )
T		120	250	
S	5 <sup>17</sup>	20 <sup>15</sup>	250 <sup>14</sup>	80 <sup>16</sup>
L3		100	75	
R <sub>2</sub>	8.75 <sup>13</sup>	50 <sup>11</sup>	175 <sup>10</sup>	286 <sup>12</sup>
L2		50	25	
R <sub>1</sub>	4.5 <sup>9</sup>	30 <sup>7</sup>	150 <sup>6</sup>	200 <sup>8</sup>
L1	2	20	100 <sup>5</sup>	
B	1 <sup>4</sup>	20 <sup>2</sup>	50 <sup>1</sup>	400 <sup>3</sup>

5.

$$I_B = 1A \quad 1$$

$$V_B = V_{L1} = 22V \quad 2$$

$$R_B = \frac{V_B}{I_B} = \frac{22V}{1A} = 22\Omega \quad 3$$

$$P_B = V_B I_B = 22V * 1A = 22W \quad 4$$

$$I_{R1} = I_B + I_{L1} = 1A + 1.2A = 2.2A \quad 5$$

$$V_{R1} = V_{L2} - V_{L1} = 33V - 22V = 11V \quad 6$$

$$R_1 = \frac{V_{R1}}{I_{R1}} = \frac{11V}{2.2A} = 5\Omega \quad 7$$

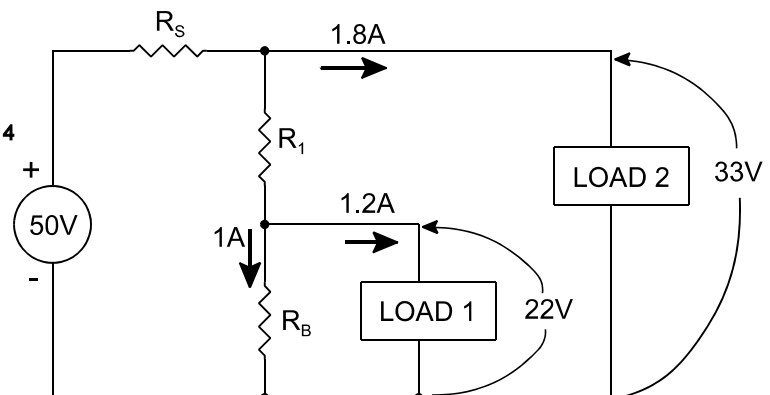
$$P_{R1} = V_{R1} I_{R1} = 11V * 2.2A = 24.2W \quad 8$$

$$I_T = I_{R1} + I_{L2} = 2.2A + 1.8A = 4A \quad 9$$

$$V_S = V_T - V_{L2} = 50V - 33V = 17V \quad 10$$

$$R_S = \frac{V_S}{I_T} = \frac{17V}{4A} = 4.25\Omega \quad 11$$

$$P_S = V_S I_T = 17V * 4A = 68W \quad 12$$



	P (W)	V (V)	I (A)	R ( $\Omega$ )
T		50	4 <sup>9</sup>	
S	68 <sup>12</sup>	17 <sup>10</sup>	4 <sup>9</sup>	4.25 <sup>11</sup>
L2		33	1.8	
R <sub>1</sub>	24.2 <sup>8</sup>	11 <sup>6</sup>	2.2 <sup>5</sup>	5 <sup>7</sup>
L1		22	1.2	
B	22 <sup>4</sup>	22 <sup>2</sup>	1 <sup>1</sup>	22 <sup>3</sup>