Elektriese Stroombane Memo
November 2018/1

1.10 C ✓✓ (2)

QUESTION 12/*VRAAG 12*

12.1

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓ $\frac{1}{4,8} = \frac{1}{4R} + \frac{1}{6R}$ ✓ $R = 2\ \Omega$ ✓	$R_p = \frac{R_1 R_2}{R_1 + R_2}$ ✓ $4,8 = \frac{4R \times 6R}{4R + 6R}$ ✓ $R = 2\ \Omega$ ✓

(3)

12.2

POSITIVE MARKING FROM QUESTION 12.1
POSITIEWE NASIEN VANAF VRAAG 12.1

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$V_{4R} = IR_{4R}$ $= 1,8(4)(2)$ ✓ $= 14,4$ V $I_{6R} = \frac{V}{R_{6R}}$ $I_{6R} = \frac{14,4}{12}$ ✓ $= 1,2$ A $V_{2R} = IR$ ✓ $= 1,2(4)$ ✓ $= 4,8$ V ✓	$V_{4R} = IR_{4R}$ $= 1,8(4)(2)$ ✓ $= 14,4$ V $I_T = \frac{V}{R_T}$ $I_T = \frac{14,4}{4,8}$ $= 3$ A $I_{2R} = 3 - 1,8$ ✓ $= 1,2$ A $V_{2R} = IR$ ✓ $= 1,2(4)$ ✓ $= 4,8$ V ✓
OPTION 3/*OPSIE 3*	**OPTION 4/*OPSIE 4***
$R_1 : R_2$ 4 : 6 $I_1 : I_2$ 6 : 4 $\frac{6}{10} \times I = 1,8$ A ✓ $I_T = 3$ A $I_{2R} = 3 - 1,8$ ✓ $= 1,2$ A $V_{2R} = IR$ ✓ $= 1,2(4)$ ✓ $= 4,8$ V ✓	$V_{4R} = IR_{4R}$ $= 1,8(4)(2)$ ✓ $= 14,4$ V $R : 2R : 3R$ 1 : 2 : 3 $V_R : V_{2R} : V_{3R}$ 1 : 2 : 3 ✓ $V_{2R} = \frac{2}{6} \times 14,4$ ✓ $= 4,8$ V ✓

(5)

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12.3

POSITIVE MARKING FROM QUESTION 12.1 AND 12.2 ***POSITIEWE NASIEN VANAF VRAAG 12.1 EN 12.2***		
OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***	**OPTION 3/*OPSIE 3***
$W = I^2R\Delta t$ ✓ $= 1,8^2(8)(120)$ ✓ $= 1036,8$ J ✓	$W = VI\Delta t$ ✓ $= (14,4)(1,8)(120)$ ✓ $= 3110,4$ J ✓	$W = \frac{V^2\Delta t}{R}$ ✓ $W = \frac{(14,4)^2(120)}{8}$ ✓ $W = 3110,4$ J ✓

(3)

12.4 Decrease/*Neem af* ✓ (1)

12.5 The ammeter has such a low resistance ✓
It short circuits the parallel part and all current flows through the ammeter. ✓
OR
The ammeter short circuits the resistors ✓
No current flows through resistor 2R ✓

Die ammeter het so 'n lae weerstand
Dit kortsluit die parallelgedeelte en al die stroom vloei deur die ammeter.
OF
Die ammeter kortsluit die resistors
Daar vloei geen stroom deur resistor 2R nie

(2)
[14]

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1.10 B ✓✓ (2)

QUESTION/*VRAAG 10*

10.1.1 Power is the rate at which work is done/energy is transfered. ✓✓
Drywing is die tempo waarteen arbeid verrig /energie oorgedra word ✓✓ (2)

10.1.2

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***

$\frac{1}{R_{//}} = \frac{1}{R_1} + \frac{1}{R_2}$
$\frac{1}{R_{//}} = \frac{1}{6} + \frac{1}{15}$ ✓
$R_{//} = 4,29\ \Omega$ ✓
	$R_{//} = \frac{R_1 \times R_2}{R_1 + R_2}$
	$R_{//} = \frac{6 \times 15}{6 + 15}$ ✓
	$R_{//} = 4,29\ \Omega$ ✓

(2)

10.1.3 **POSITIVE MARKING FROM QUESTION 10.1.2**
POSITIEWE NASIEN VANAF VRAAG 10.1.2

$P = \frac{V^2}{R}$ ✓

$50 = \frac{V^2}{4,29}$ ✓

V = 14,65 V ✓ (3)

10.1.4 **POSITIVE MARKING FROM QUESTION 10.1.2 and 10.1.3**
POSITIEWE NASIEN VANAF VRAAG 10.1.2 en 10.1.3

OPTION 1/*OPSIE 1*	**OPTION 2/*OPSIE 2***
$R = \frac{V}{I}$ ✓ $4,29 = \frac{14,65}{I}$ ✓ I = 3,41 A ✓	P = VI ✓ 50 = (14,65)I ✓ I = 3,41 A ✓
OPTION 3/*OPSIE 3*	**OPTION 4/*OPSIE 4***
P = I^2R ✓ 50 = I^2(4,29) ✓ I = 3,41 A ✓	V = IR ✓ 14,65 = I(6) I = 2,44 A V = IR 14,65 = I(15) I = 0,98 A 2,44 + 0,98 ✓ = 3,42 A ✓

(3)

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10.1.5 Decreases ✓
Neem af ✓ (1)

10.1.6 The total resistance increases ✓
The current in the circuit decreases ✓
The resistance of R is constant, ✓ then the potential difference across R decreases.
Totale weerstand neem toe ✓
Die stroom in die stroombaan neem af ✓
Die weerstand van R is konstant ✓ *so die potensiaalverskil oor resistor R sal afneem* (3)

10.2.1 $P = \frac{W}{\Delta t}$ ✓

2 000 ✓ = $\frac{W}{18\,000}$ ✓

$W = 3{,}6 \times 10^7$ J ✓ (4)

10.2.2 Cost = price x unit kWh / *Koste = prys x eenheid kWh*
Cost = 80(2)(5)(30) ✓
Cost = 24 000 cents = R240 ✓
(answer can be given in rand or cents)
(antwoord kan in rand of sent gegee word) (2)
[20]

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1.3 C √√ (2)

1.6 C √√ (2)

9.1 The potential difference (voltage) across a conductor is directly proportional to the current ✓ in the conductor at constant temperature. ✓
Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier by konstante temperatuur.

OF/*OR*

Ratio of potential difference to current is constant ✓ ***at*** constant temperature. ✓
Die verhouding van die potensialverskil tot stroom is konstant by konstante temperatuur. (2)

9.2 **Option/*Opsie* 1**

$$Rp = \frac{(R_A \times R_B)}{(R_A + R_B)} \checkmark$$

$$2 \checkmark = \frac{(6\ R_B)\checkmark}{(6 + R_B)\checkmark}$$

$2\ (6 + R_B) = 6R_B$
$12 + 2R_B = 6R_B$
$R_B = 3\ \Omega$ ✓

Option/*Opsie* 2

$$\frac{1}{Rp} = \frac{1}{RA} + \frac{1}{RB} \checkmark$$

$$\frac{1}{2}\checkmark = \frac{1}{6}\checkmark + \frac{1}{RB}\checkmark$$

$$\frac{1}{RB} = \frac{1}{2} - \frac{1}{6}$$

$$\frac{1}{RB} = \frac{2}{6}$$

$R_B = 3\ \Omega$ ✓

(5)

9.3 $R_T = R_P + R_S$ ✓
$= 2$ ✓ $+ 6$ ✓
$= 8\ \Omega$ ✓
$I = \frac{V}{R}$ ✓ $= \frac{24}{8}$ ✓ $= 3A$ ✓

(7)

9.4 **Option/*Opsie* 1**
$V_P = IRp$ ✓
$= 3$ ✓ $\times 2$ ✓
$= 6\ V$ ✓

$Vp = V_A$ ✓ $= V_B$
$V_A = 6\ V$ ✓✓ (2 or 0 marks/*punte*)

Option/*Opsie* 2
$V_C = IR_6$ ✓
$= 3$✓ X 6✓
$= 18\ V$ ✓
$V_T = Vp + V_C$ ✓
$24 = Vp + 18$
$Vp = 6\ V$ ✓✓ (2 or 0 marks/*punte*) (7)

[21]

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1.9 A ✓✓

1.10 C ✓✓

QUESTION/*VRAAG 13*

13.1 13.1.1 $P = I^2R$ ✓
$0,5 = I^2 8$ ✓
$I = 0,25$ A ✓

$\frac{1}{R_p} = \frac{1}{r_1} + \frac{1}{r_2}$ ✓ $= \frac{1}{6} + \frac{1}{(6+6)}$ ✓ $= \frac{3}{12}$ ✓ $\therefore R_p = 4\ \Omega$

$R_T = \frac{8 + 4}{}$ ✓ $= 12\ \Omega$

$V_T = I R_T = (0,25)(12) = 3V$ ✓ (8)

13.1.2 $V_p = IR$ ✓ $= (0,25)(4)$ ✓ $= 1V$
$I = \frac{V_p}{R} = \frac{1}{6}$ ✓ $= 0,17$ A ✓ (4)

13.2 13.2.1 $P = \frac{V^2}{R}$ ✓
750 ✓ $= \frac{240^2}{R}$ ✓
$R = 76,80\ \Omega$ ✓

OR/*OF*

✓
$P = VI$
750 ✓ $= 240\ I$ ✓
$I = 3,13$ A

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

$= \frac{240}{3,13}$
$= 76,80\ \Omega$ ✓ (4)

13.2.2 $E = Px\ t = \frac{750 \times 6}{}$ ✓ $= 4\ 500$ Wh $= 4,5$ kWh

Cost/*Koste* $= \frac{4,5 \times 1,14}{}$ ✓ $= R\ 5,13$ ✓

OR/*OF*

Cost/*Koste* $= \frac{(0,75)(6)}{}$ ✓ $(1,14)$ ✓ $= R5,13$ ✓ (3)
[19]

1.10 D ✓✓ (2)

QUESTION 11/*VRAAG 11*

11.1 The potential difference across a conductor is directly proportional to the current in the conductor ✓at constant tempearature.✓
Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom in die geleier by konstante temperatuur.
OR/*OF*
Provided temperature and other physical conditions are constant✓, the potential difference across a conductor is directly proportional to the current✓.
Mits die temperatuur en ander fisiese toestande konstant is, is die potentsiaalverskil oor 'n geleier direk eweredig aan die stroom. (2)

11.2 **OPTION 1/*OPSIE 1***

$V_1 = IR_{6\Omega}$✓
$= 0,6\ (6)$ ✓
$= 3,6\ V$
$I_{4\Omega} = \frac{3,6}{4}$ ✓
$\therefore I_{4\Omega} = 0,9\ A$✓

OPTION 2/*OPSIE 2*

$V = IR$✓
$(0,6)(6) = I_{4\Omega}(4)$ ✓
$I_{4\Omega} = \frac{(0,6)(6)}{4}$ ✓
$= 0,9\ A$✓ (4)

11.3 **POSITIVE MARKING FROM QUESTION 11.2.1**
POSITIEWE NASIEN VANAF VRAAG 11.2.1

$I_{tot} = I_{6\Omega} + I_{4\Omega}$
$= (0,6 + 0,9)$ ✓
$I_{tot} = 1,5\ A$✓ (2)

11.4 **POSITIVE MARKING FROM QUESTION 11.2.1 AND QUESTION 11.2.2**
POSITIEWE NASIEN VANAF VRAAG 11.2.1 EN VRAAG 11.2.2

$V_X = V_{tot} - V_1$
$=(6 - 3,6)$ ✓
$=2,4\ V$
$V = IR$✓
$X = \frac{2,4}{1,5}$
$= 1,6\ \Omega$✓ (3)

11.5 Energy/*Energie* $W = I^2 R\Delta t$ ✓
For the same time interval ✓$I^2 R\Delta t$ will be greater for the 4Ω resistor than for the 6Ω resistor. ✓
Vir dieselfde tydinterval sal $I^2R\Delta t$ groter wees vir die 4 Ω-resistor as vir die 6 Ω-resistor.

OR/*OF*

Energy/*Energie* $W = \frac{V^2}{R}\Delta t$ ✓

For the same potential difference and time✓ $\frac{V^2}{R}\Delta t$ is greater for the smaller resistance than for the larger resistance. ✓

Vir dieselfde potensiaalverksil en tyd is $\frac{V^2}{R}\Delta t$ groter vir die kleiner weerstand as vir die groter weerstand. (3)

[14]

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2.8 C (2)

2.10 B (2)

QUESTION/VRAAG 11

11.1	11.1.1	3V √	(1)
	11.1.2	I = V/R √ = 3/5 √ = 0,6 A √	(3)
	11.1.3	I = V/R = 3 √ /7 √ = 0,43 A V_2 = IR √ = 0,43 x 4 √ = 1,72 V √ (accept/*aanvaar* 1,71 V)	(5)
11.2	11.2.1	P = $\frac{V^2}{R}$ √ OR/OF P = VI 2600 √= $\frac{220^2}{R}$ √ 2600= 220 I √ R = 18,62 Ω √ I = 11,82 A R = V/I = 220/11,82 √ = 18,62 Ω √ both equations/ *beide vergelykings* √	(4)
	11.2.2	Cost = (2,6 x 3,5) √ x 1,04 √ = R9,46 √ OR/OF E = Pt = 2,6 kW x 3,5 h √ = 9,1 kWh Cost = 9,1 kWh x R1,04 √ = R9,46 √	(3)

[16]

1.10 B ✓✓ (2)

QUESTION 12/*VRAAG 12*

12.1 Resistance = gradient of graph
12.1.1 *Weerstand = helling van grafiek*

$$= \frac{4-0\checkmark}{25\times10^{-3}-0\checkmark}$$

$= 160\ \Omega\ \checkmark$ (3)

12.1.2 Graph at T_1 ✓/*Grafiek by T_1* ✓
Steeper/larger gradient/*Steiler helling* ✓
∴ R is greater/*R is groter* ✓
∴ Temperature is higher/*Temperatuur is hoër* (3)

12.1.3 V is directly proportional to I at each of the temperatures T_1 and T_2. ✓
V is direk eweredig aan I by elk van die temperature T_1 en T_2 (1)

12.1.4 $P = VI$ ✓
$= (2,5)(25 \times 10^{-3})$ ✓
$= 0,06(2)$ W ✓ (3)

12.2
12.2.1 Both switches open:/*Beide skakelaars oop:*
$R = 6\ \Omega + 1\Omega + 2\Omega = 9\ \Omega$ ✓

$$R = \frac{V}{I}\checkmark$$

$$9 = \frac{4,5}{I}\checkmark$$

$\therefore I = 0,5$ A ✓ (4)

12.2.2 Both switches closed:/*Beide skakelaars gesluit:*
$V_{6\Omega} = IR = (0,5)(6) = 3$ V ✓
$V_{2\Omega} = 4,5 - 3 = 1,5$ V ✓

$$I_{2\Omega} = \frac{V}{R} = \frac{1,5}{2} = 0,75\text{ A}\checkmark$$

$I_R = 0,75 - 0,5 = 0,25$ A ✓

$$R = \frac{V}{I} = \frac{3}{0,25}\checkmark = 12\ \Omega\ \checkmark$$

(6)
[20]