higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

INGENIEURSWETENSKAP N2

24 November 2023

Hierdie nasienriglyn bestaan uit 7 bladsye.

Kopiereg voorbehou

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VRAAG 1

1.1 Versnelling is die veranderingstempo in snelheid. (1)

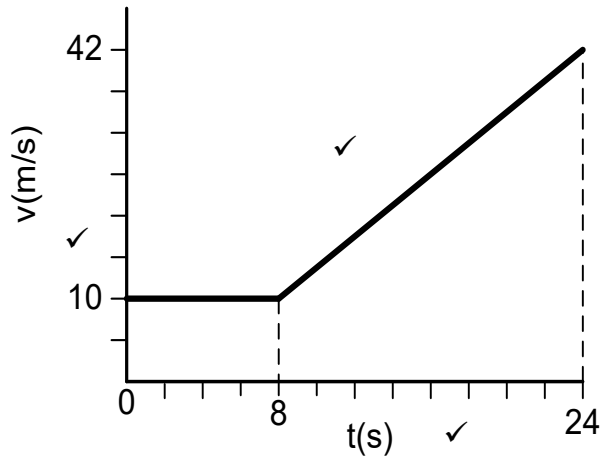
1.2 1.2.1 $u = \frac{36}{3.6} = 10$ m/s (1)

1.2.2 $V = u + at$

$= 10 + 2(16)$ ✓

$= 42$ m/s ✓ (2)

1.2.3



(3)

1.2.4 $S = lb + \frac{1}{2}bh$

$= (24 \times 10) + \left(\frac{1}{2} \times 16 \times 32\right)$ ✓

$= 240 + 256$

$= 496$m ✓

OR S $= (10 \times 8) + \left(\frac{42+10}{2}\right) \times 16$✓

=496m✓ (2)

1.2.5 $V = \frac{s}{t} = \frac{496}{24}$ ✓$= 20{,}667$ m/s✓ (2)

1.3 1.3.1 $a = \frac{V-u}{t} = \frac{25-30}{0{,}5}$ ✓ $= -10$ m/s^2 ✓

1.3.2 $S = ut + \frac{1}{2}at^2$

$= 30(0{,}5) + \frac{1}{2}(-10)(0{,}5)^2$ ✓

$= 13.75$m ✓

OF

$S = \frac{V^2-u^2}{2a}$

$= \frac{25^2-30^2}{2(-10)}$

13.75 m

OF

$S = \left(\frac{V+u}{2}\right) \times t$

$= \left(\frac{25+30}{2}\right) \times 0{,}5$

$= 13.75$ m

(2 × 2) (4)

[15]

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VRAAG 2

2.1
- Die algebraïese som van die kragte in enige rigting is gelyk aan sero.
- Die algebraïese som van die kragmomente om enige punt is gelyk aan sero. (2)

2.2
2.2.1 aangrensende sye
2.2.2 resultant
2.2.3 diagonaal
(3 × 1) (3)

2.3 2.3.1
$F = 90\ sin\ 45^0$ ✓
$= 63{,}64$ N ✓ (2)

2.3.2 Neem momente om R
$\Sigma \circlearrowleft M = \Sigma \circlearrowright M$

$124{,}728 \times (7 + x) = (80 \times 7) + (140 \times 4) + (63{,}64 \times 2)$ ✓
$124{,}728x = 374{,}184$✓
$x = 3$ m✓ (3)
[10]

VRAAG 3

3.1
$E_P = mgh$
$= 0{,}3 \times 9{,}8 \times 11$✓
$= 32{,}34$J✓ (2)

3.2
$V = \sqrt{2gh}$
$= \sqrt{2 \times 9{,}8 \times 5}$
$= 9{,}899$ m/s✓

$\therefore E_k = \frac{1}{2}mv^2$
$= \frac{1}{2} \times 0{,}3 \times (9{,}899)^2$
$= 14{,}699$J✓ (2)

3.3
$V = \sqrt{2 \times 9{,}8 \times 11} \quad = 14.683 m/s$
$V = u + gt$ ✓
$14.683 = 0 + 9.8t$ ✓
$t = 1.498\ s$ ✓ (3)
[7]

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VRAAG 4

4.1 Wringkrag is die produk van krag en die loodregte radius tot die kragtelyn. (1)

4.2 4.2.1
$F = w \sin\theta$
$= 1000 \times 9{,}8 \times \sin 2\,0^0$ ✓
$= 3351{,}797$ N ✓ (2)

4.2.2
$S = vt$
$= 15 \times 8$
$= 120$m ✓

$W = F \times S$
$= 3351{,}797 \times 120$ ✓
$= 402215{,}64$ J ✓ **OF** 402215.689J
(gebruik F soos in vergelyking 4.2.1) (3)

4.2.3
$P = FV$
$= 3351{,}797 \times 15$✓
$= 50276{,}955$ W✓

OF

$P = \frac{W}{t}$

$= \frac{402215{,}955}{8}$

$= 50276{,}955$W **OR** 50276.961W (2)

4.3 $T = F \times r$ $r = 0{,}175m$
$= 1650 \times 0{,}175$ ✓
$= 288{,}75$ N·m ✓ (2)
[10]

VRAAG 5

5.1
- Rataandrywings is lawaaierig
- Dit is aan slytasie onderworpe
- Smering is nodig
- Weerstand teen skok is swak
- Redelik goedkoop om te produseer (Enige 3 × 1) (3)

5.2 5.2.1
$N_A \,.\, T_A = N_B \,.\, T_B$
$N_B = \frac{11 \times 45}{90}$ ✓
$= 5{,}5$ r/s ✓

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5.2.2 $$VR = \frac{N_A}{N_B}$$
$$= \frac{11}{5,5} \checkmark$$
$$= 2 \checkmark$$

(2 × 2) (4)

5.3 5.3.1 $$L = MA \times E$$
$$= 20 \times 800 \checkmark$$
$$= 16000 \text{ N} \checkmark$$

5.3.2 $$DR = MA \times \frac{100}{\eta}$$
$$= 20 \times \frac{100}{75} \checkmark$$
$$= 26,667 \checkmark$$

5.3.3 $$DR = \frac{2S}{S - s}$$
$$26,667(30 - s) = 2(30) \checkmark$$
$$s = 27,75 \quad \approx 28 \checkmark$$

(2 × 3) (6)

5.4 Pascal is die resulterende druk wanneer 'n krag van 1 N eweredig en loodreg op 'n oppervlakte van 1 m^2 aangewend word. (1)

5.5
- Digtheid
- Swaartekragversnelling
- Diepte van die vloeistof

(3)
[17]

VRAAG 6

6.1 Wrywing is die krag wat beweging tussen twee oppervlakke wat in kontak is, teenstaan. (1)

6.2 6.2.1 $$F_c = w \cos\theta$$
$$= 784 \times cos\, 2\,3^0 \checkmark$$
$$= 721,676 \text{ N} \checkmark$$

6.2.2 $$F_s = w \sin\theta$$
$$= 784 \times sin\, 2\,3^0 \checkmark$$
$$= 306,333 \text{ N} \checkmark$$

6.2.3 $$F_\mu = \mu \times w \cos\theta$$
$$= 0.3 \times 721,676 \checkmark$$
$$= 216,503 \text{ N} \checkmark$$

6.2.4 $$F_{up} = F_\mu + w \sin\theta$$
$$= 216,503 + 306,333 \checkmark$$
$$= 522,836 \text{ N} \checkmark$$

(4 × 2) (8)
[9]

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VRAAG 7

7.1 Termometer (1)

7.2
- Oorspronklike lengte
- Tipe materiaal (langsuitsettingskoëffisiënt)
- Verandering in temperatuur (3)

7.3 $Q = mc\Delta t$
$= 500 \times 4187 \times (90 - 8)$ ✓
$= 171667000$ J✓

$m = \frac{Q}{h_v}$
$= \frac{171,667}{30}$
$= 5,722$ kg ✓
(3)

7.4 7.4.1 $\Delta t = t_2 - t_1$
$= 36,7 - 13$
$= 23,7\ ^0$C ✓ (1)

7.4.2 $\Delta h = h_o \alpha \Delta t$
$= 2200 \times 0,000012 \times 23,7$ ✓
$= 0,626$ mm ✓ (2)

7.4.3 $h_f = \Delta h + h_o$
$= 0,626 + 2200$
$= 2200,626$ mm ✓ (1)
[11]

VRAAG 8

8.1 8.1.1 Onwaar – die verskynsel word dissosiasie genoem.
8.1.2 Waar – 'n atoom wat 'n elektron bykry is as 'n anioon (negatiewe ioon) bekend.
8.1.3 Waar – protone (positief) en neutrone (neutraal) in die kern veroorsaak dat dit positief gelaai is.
8.1.4 Onwaar – gedistilleerde water beskik oor 'n hoë weerstand en het geen ione nie; dit word dus as 'n isolator geklassifiseer.
(4 × 1) (4)

8.2 Negatiewe lading (1)

8.3
- Vir estetiese redes
- Om bevlekking te voorkom
- Om dikte te verhoog
- Om hindernisse te beskerm
- Om wrywing te voorkom
- Om elektrisiteit te gelei (Enige 3 × 1) (3)
[8]

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VRAAG 9

9.1 $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$

$\frac{1}{R_p} = \frac{1}{2} + \frac{1}{6}$ ✓

$\frac{1}{R_p} = \frac{8}{12}$

$R_p = 1{,}5\ \Omega$ ✓ (2)

9.2 $R_s = 3 + 4$

$= 7\ \Omega$ ✓

$\frac{1}{R_p} = \frac{1}{7} + \frac{1}{32}$ ✓

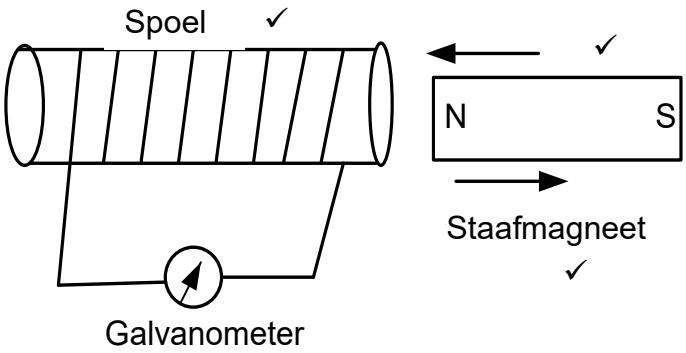
$\frac{1}{R_p} = \frac{39}{244}$

$R_p = 5.744\ \Omega$

$\therefore R_t = 5{,}744\ \Omega$ ✓ (3)

9.3
- Resistiwiteit
- Lengte
- Deursneeoppervlakte
- Temperatuur (Enige 2 × 1) (2)

9.4



(3)

9.5
- Transformators
- Elektriese motors
- Generators (Enige 2 × 1) (2)

9.6 Selfinduksie is die eienskap van 'n spoel om as gevolg van die magnetiese koppeling tussen die wikkelings 'n elektromotoriese krag in homself te ontwikkel. (1)

[13]

TOTAAL: 100

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