higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NASIENRIGLYN

NASIONALE SERTIFIKAAT

INGENIEURSWETENSKAP N2

29 Julie 2021

Hierdie nasienriglyn bestaan uit 7 bladsye.

Kopiereg voorbehou

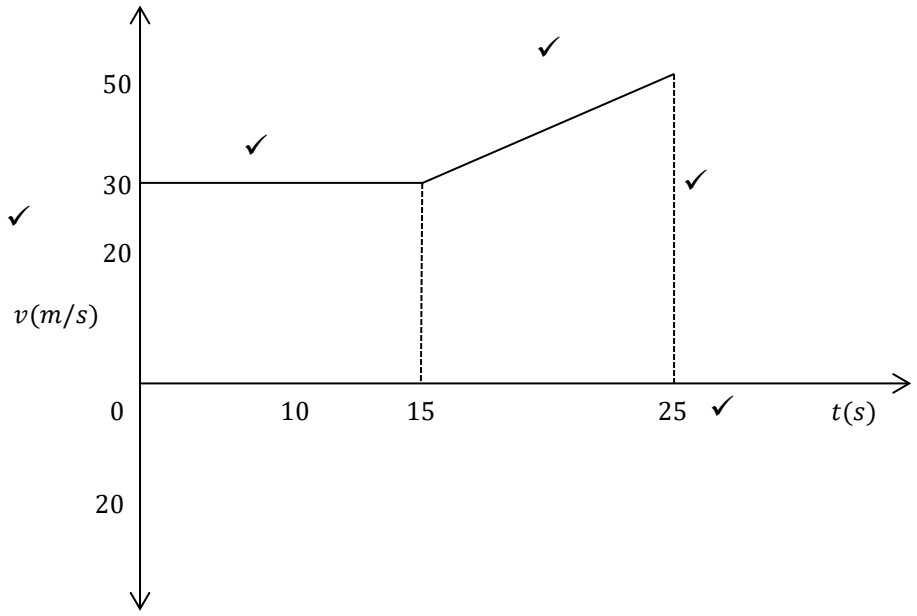
VRAAG 1

1.1 1.1.1 Reguit afstand van die beginpunt na die eindpunt

1.1.2 Tempo van snelheidsverandering

(2 × 1) (2)

1.2 1.2.1



(5)

1.2.2 $a = \frac{v_{15s-25s}}{t_{15s-25s}}$
$= \frac{50-30}{25-15}$✓
$= 2\ m/s^2$✓ (2)

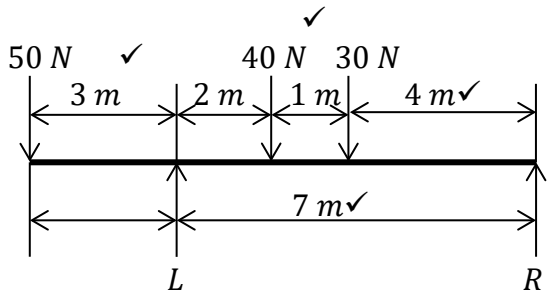
1.2.3 $S_{0-25s} = L \times B + L \times B + \frac{1}{2}bh$
$= (15)(30)$✓ $+ (10 \times 30)$✓ $+ \frac{1}{2}(10)(20)$✓
$= 850\ m$✓ (4)

1.2.4 $v_{0-25s} = \frac{s_{0-25s}}{t_{0-25s}}$
$= \frac{850}{25}$✓
$= 34\ m/s$✓ (2)

[15]

VRAAG 2

2.1



(4)

2.2 Neem momente om L:

$$\sum \curvearrowleft F = \sum \curvearrowright F$$
$$(40 \times 2) + (30 \times 3) = (R \times 7) + (50 \times 3)\checkmark\checkmark$$
$$R = 2,857\ N\checkmark$$

Neem momente om R:

$$\sum \curvearrowleft F = \sum \curvearrowright F$$
$$(L \times 7) = (30 \times 4) + (40 \times 5) + (50 \times 10)\checkmark\checkmark$$
$$L = 117,143\ N\checkmark$$

(6)

[10]

VRAAG 3

3.1 Die energie waaroor 'n voorwerp of liggaam beskik✓ of as gevolg van sy posisie beskik.✓ (2)

3.2 3.2.1

$$E_P = mgh$$
$$= (5 \times 9,8 \times 8\checkmark$$
$$= 392\ J\checkmark$$

(2)

3.2.2

$$v^2 = u^2 + 2gs$$
$$= (0)^2 + 2(9,8)(2)$$
$$= 6,261\ m/s\checkmark$$

$$E_{K(B)} = \frac{1}{2}mv^2$$
$$= \frac{1}{2}(5)(6,261)^2\checkmark$$
$$= 98\ J\checkmark$$

OF

$E_P = mgh$
= 5 x 9.8 x (8 – 2)
= 294 J✓

$$E_P\ @\ 8m - E_P\ @\ 6m = 392 - 294\checkmark$$
$$= 98J\checkmark$$

(3)

[7]

VRAAG 4

4.1 Dit is die vermoë om arbeid te verrig (1)

4.2 4.2.1

$$W_C = 20 \times 30$$
$$= 600\text{N}✓$$

$$W_D = \frac{1}{2}bh + L \times B$$
$$= \frac{1}{2}(30)(600)✓ + (30 \times 5\,000)✓$$
$$= 159\,000\,J\ OR\ 159\,KJ✓$$

OF

$$W_D = F_{AVE} \times s$$
$$= \frac{5\,000+5\,600✓}{2} \times 30✓$$
$$= 159\,000\,J\ OR\ 159\,KJ✓$$ (4)

4.2.2

$$P = \frac{W}{t}$$
$$= \frac{159\,000}{300}✓✓$$
$$= 530\,W✓$$ (3)

4.3

$$F_{UP} = F_{\parallel} = mgSin\theta$$
$$= 40 \times 9{,}8 \times Sin20°✓$$
$$= 134{,}072\,N✓$$ (2)

[10]

VRAAG 5

5.1 5.1.1

$$N_AT_A = N_BT_B$$
$$750 \times 25 = N_B \times 50✓$$
$$N_B = 375\,r/min✓$$ (2)

5.1.2

$$VR = \frac{N_A}{N_B}$$
$$= \frac{750}{375}✓$$
$$= 2:1✓$$ (2)

5.2
- Ewenaarwenashystoestel
- Ewenaarwindas
- Weston-ewenaarkatrol (Enige 2 × 1) (2)

5.3 5.3.1

$$MA = \frac{LOAD}{EFFORT}$$
$$= \frac{0{,}8\times9{,}8}{0{,}06\times9{,}8}✓$$
$$= 13,33✓$$ (2)

5.3.2 $VR = \frac{effort\ dist}{load\ dist}$

$effort\ dist = VR \times \frac{\pi(d_1 - d_2)}{2}$✓
$effort\ dist = 20 \times \frac{\pi(300-240)}{2}$ ✓ = 1884.956mm✓ (3)

5.3.3 $\eta = \frac{MA}{VR} \times 100\%$
$= \frac{13,33}{20} \times 100\%$✓
$= 66.67\%$ (2)

5.4 5.4.1 $v = \pi DN$
$= \pi \times 0,3 \times 50$✓
$= 47,124\ m/s$ ✓ (2)

5.4.2 $P = (T_1 - T_2)V$
$P = (5 \times 500 - 500)47.124$ ✓
$T_1 = 94.248kW$✓ (2)
[17]

VRAAG 6

6.1.1 $F_{\parallel} = mgSin\theta$
$= 75 \times 9,8Sin40°$✓
$= 472,449\ N$✓ (2)

6.1.2 $F_{\perp} = mgCos\theta$
$= 75 \times 9,8Cos40°$✓
$= 563,043\ N$✓

$\mu = \frac{F_{\mu}}{F_N}$
$0,4 = \frac{F_{\mu}}{563,043}$✓
$F_{\mu} = 225,217\ N$✓

$F_{APP} = F_{\parallel} + F_{\mu}$
$= 472,449 + 225,217$✓
$= 697,666\ N$✓ (6)

6.2 $Pressure = P_a + \rho gh$
$Pressure = 101.3 + 1 \times 9,8 \times 5$✓ (2)
$Pressure = 150.35KPa$✓ **[10]**

VRAAG 7

7.1 Bimetaalstroke wat gebruik word om termostate te bedryf. (1)

7.2 $\Delta l = l_o \,.\alpha\,.\Delta t$
$\alpha = 0.007245/(5 \times (89 - 26)$✓
$= 23 \times 10^{-6}$ /°C✓

Die metaal in die staaf is aluminium.✓ (3)

7.3 7.3.1 Hoeveelheid warmte-energie wat nodig is om die temperatuur van 1 kg (massa-eenheid) van 'n stof met 1 graad Celsius te verhoog.

7.3.2 Warmte wat geen verandering in temperatuur veroorsaak nie/Warmte tydens die verandering van fase tussen water en stoom.

7.2.3 Warmte wat 'n toename in temperatuur in 'n enkele fase veroorsaak wat ys, water en droë stoom kan wees.

(3 × 2) (6)
[10]

VRAAG 8

8.1 Dit is ’n suiwer stof wat nie deur chemiese metodes in eenvoudiger stowwe afgebreek kan word nie. (2)

8.2
- Koper
- Natrium
- Fluoor (Enige 2 × 1) (2)

8.3
- Water
- Natriumchloried
- Ammoniak (Enige 2 × 1) (2)

8.4
- Positiewe ione
- Negatiewe ione (2)

[8]

VRAAG 9

9.1 Dit is indirek of omgekeerd eweredig aan mekaar. (2)

9.2
- Dit veroorsaak dat die borsels van 'n motor vonk.
- Werwelstrome wat deur warmte veroorsaak word.
- Elektroniese apparaat kan deur weerlig oor 'n afstand beskadig word.
- Dit mag wanfunksionering van elektroniese apparaat veroorsaak. (3)

9.3 9.3.1
$$R_T = R_1 + \frac{R_2 \times R_3}{R_2 \times R_3}$$
$$= 3 + \frac{6 \times 4}{6+4} \checkmark\checkmark$$
$$= 5{,}4\ \Omega \checkmark$$ (3)

9.3.2
$$I_T = \frac{V_T}{R_T}$$
$$= \frac{12}{5{,}4} \checkmark$$
$$= 2{,}222\ A \checkmark$$ (2)

9.3.3
$$V_{\parallel} = I_T R_{\parallel}$$
$$= 2{,}222 \times 2{,}4$$
$$= 5{,}333\ V \checkmark$$

$$I_{6\Omega} = \frac{V_{\parallel}}{R_2}$$
$$= \frac{5{,}333}{6} \checkmark$$
$$= 0{,}889\ A \checkmark$$ (3)

[13]

TOTAAL: 100

Kopiereg voorbehou