UNIVERSITEIT VAN PRETORIA / *UNIVERSITY OF PRETORIA*
DEPT SIVIELE INGENIEURSWESE / *DEPT OF CIVIL ENGINEERING*

MECHANICS SWK122 MEGANIKA
FINAL EXAMINATION – EINDEKSAMEN

VAN en VOORLETTERS	HANDTEKENING	STUDENTENOMMER							
		1	2	3	4	5	6	7	8
SURNAME and INITIALS	SIGNATURE	STUDENT NUMBER							

Volpunte / *Full Marks:* 80 **Tyd / *Time*:** 2 ure / *hours* **November 2008**

1	2	3	4	5	Σ
12	18	18	12	20	80

INSTRUCTIONS ..... READ:
⇨ Answer all questions in the provided spaces.
⇨ The invigilators will supply no additional or loose pages.
⇨ Rough work may be done on the final blank page but this page will not be marked.
⇨ Answers in pencil will not be marked.
⇨ Tippex or any other similar product may not be used.
⇨ No highlighter may be used.
⇨ Students may ask no questions for whatever reason during the exam or test. If you are of the opinion that you need additional information, make assumptions and state these assumptions.
⇨ The relevant units must substantiate all answers.
⇨ All aspects as described in the EXAMINATION REGULATIONS are applicable.
⇨ All calculations to reach an answer must be shown.

INSTRUKSIES..... LEES:

⇨ *Beantwoord alle vrae in die spasies voorsien.*
⇨ *Die toesighouers sal geen addisionele of los bladsye voorsien nie.*
⇨ *Rofwerk mag op die laaste blanko bladsy gedoen word en hierdie bladsy word nie gemerk nie.*
⇨ *Antwoorde in potlood word nie gemerk nie.*
⇨ *Tippex of enige soortgelyke produk mag nie gebruik word nie.*
⇨ *Geen glimpen ["highlighter"] mag gebruik word nie.*
⇨ *Studente mag nie tydens die eksamen vrae vra nie – om watter rede ookal. Indien u van mening is dat addisionele inligting benodig word, maak aannames en stel die aannames.*
⇨ *Alle antwoorde moet deur die nodige eenhede bevestig word.*
⇨ *Alle aspekte soos vervat in die EKSAMENREGULASIES is van toepassing.*
⇨ *Alle berekeninge om antwoorde te bepaal moet getoon word.*

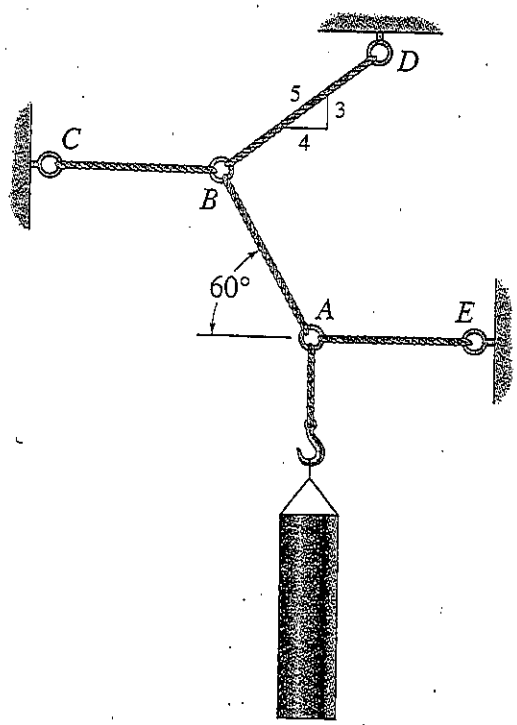
Dosente / Lecturers: Prof H Gräbe, Prof L Maree, Prof C Roth, Dr E Chaparanganda, Mr J Pretorius, Mnr F van Graan

Eksterne Eksaminator / External Examiner: Prof BWJ VAN RENSBURG

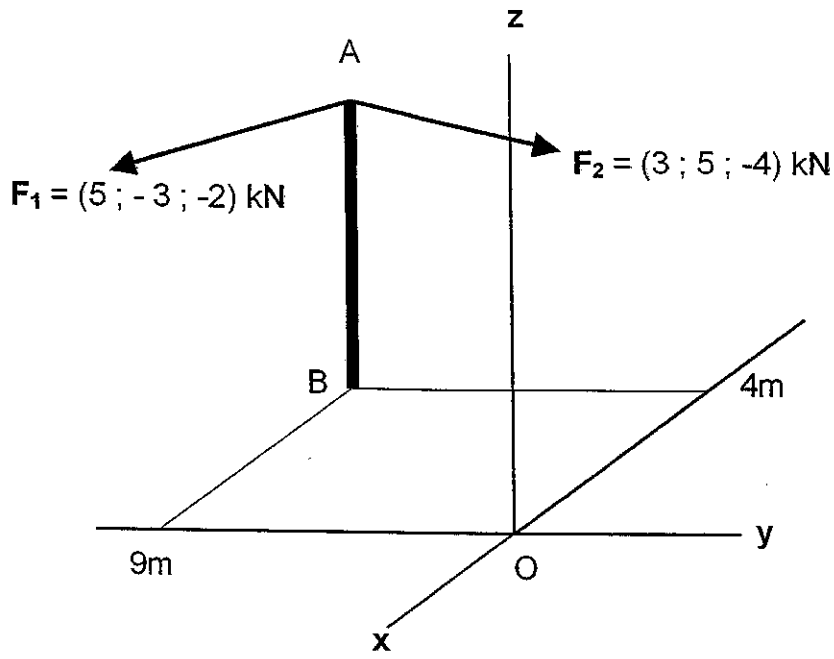
QUESTION 1 / VRAAG 1 **[12]**

The pipe is supported by a system of five cables. The maximum allowable force in any cable at any time is 6 300 N.
Determine the maximum length of pipe that can be supported by the system if the weight of the pipe is 2 100 N / m.

Die pyp word ondersteun deur 'n stelsel van vyf kabels. Die maksimum toelaatbare krag in enige kabel op enige tydstip is 6 300 N.
Bepaal die maksimum lengte pyp wat op enige tydstip deur die stelsel ondersteun kan word indien die pyp 2 100 N/m weeg.



QUESTION 2 / VRAAG 2 **[18]**



[a] The figure shows an electric distribution mast AB as well as the tension in the two electric cables. The mast is 10 metres high and weighs 1.8 kN. Draw the Free Body Diagram for the pole. **[4]**

Die figuur toon 'n elektriese maspaal AB asook die trekspanning in die twee elektriese kabels. Die mas is 10 meter hoog en weeg 1.8 kN.
Teken die Vryliggaamskets vir die paal.

[b] Determine all the reactions at B. **[14]**

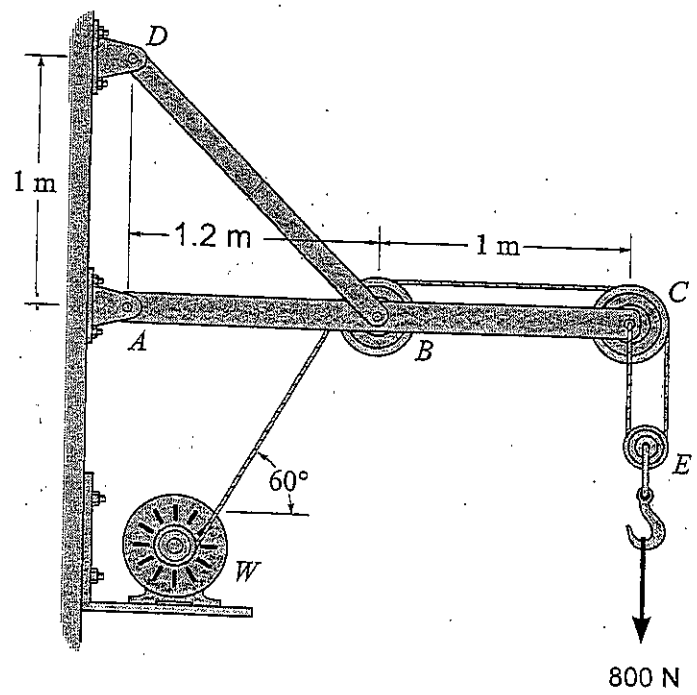
Bepaal al die reaksies by B.

QUESTION 3 / VRAAG 3

[18]

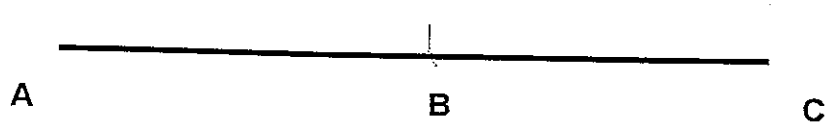
The figure shows a crane with small pulleys at B, C and E.
The crane supports a load of 800 N.

Die figuur toon 'n hyskraan met klein bandskywe by B, C en E.
'n Gewig van 800 N hang aan die kraan.



[a] Draw the Free Body Diagram for structural member ABC. **[6]**

Teken die Vryliggaamskets vir struktuurdeel ABC.

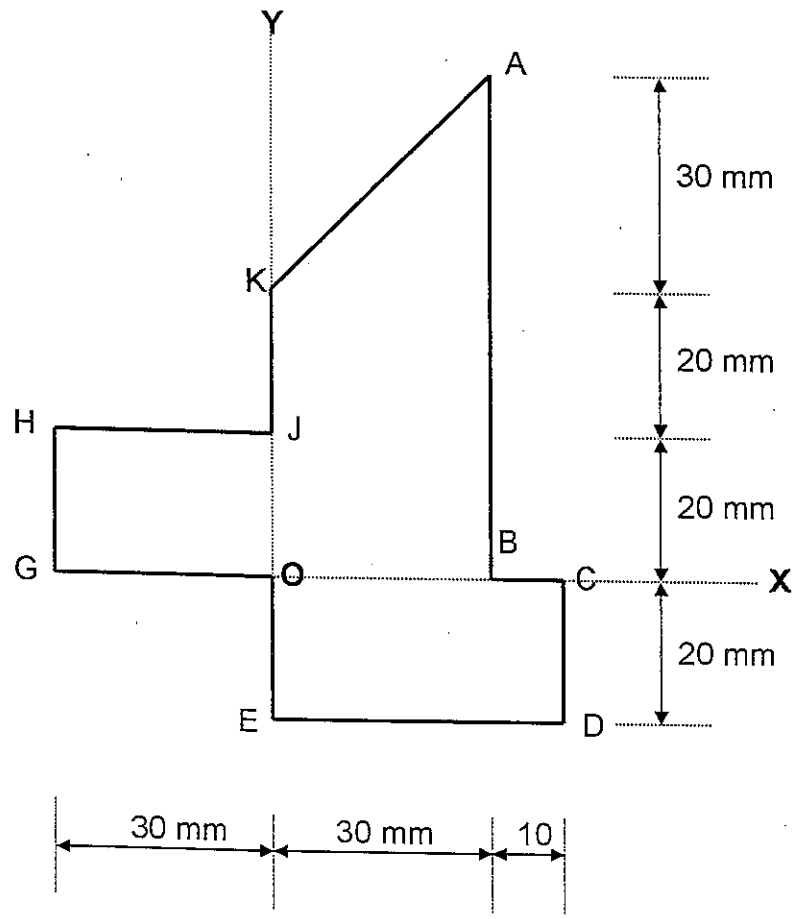


[b] Determine the force in structural member BD and state whether the force is tension or compression. **[4]**

Bepaal die krag in struktuurdeel BD en dui aan of dit 'n trekkrag of 'n drukkrag is.

[c] Determine the reactions at A. **[8]**
Bepaal die reaksies by A.

QUESTION 4 / VRAAG 4 **[12]**



4[a] Determine the **x** co-ordinate of the centroid of the given thin flat metal sheet. **[4]**

Bepaal die **x**-koördinaat van die sentroïde van die gegewe dun plat metaalplaat.

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4[b] Determine the Moment of Inertia of the given thin flat metal sheet about the Y-axis [$\mathbf{I_Y}$]. **[8]**

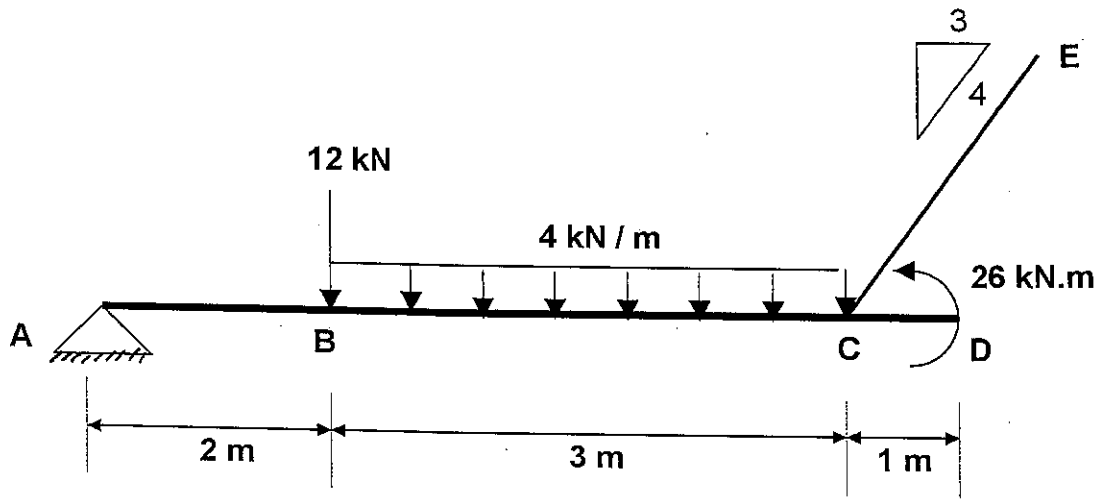
Bepaal die Traagheidsmoment van die gegewe dun plat metaalplaat om die Y-as [$\mathbf{I_Y}$].

$$I_{\triangle} = \frac{1}{36}bh^3 \qquad I_{\square} = \frac{1}{12}bh^3$$

QUESTION 5 / VRAAG 5 **[20]**

The beam AD is supported by a hinge at A and a cable CE at C.

Balk AD word ondersteun deur 'n skarnier by A en 'n kabel CE by C.



5[a] Calculate the force in cable CE. **[2]**

Bereken die krag in kabel CE.

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5[b] Calculate the reactions at A. **[4]**

Bereken die reaksies by A.

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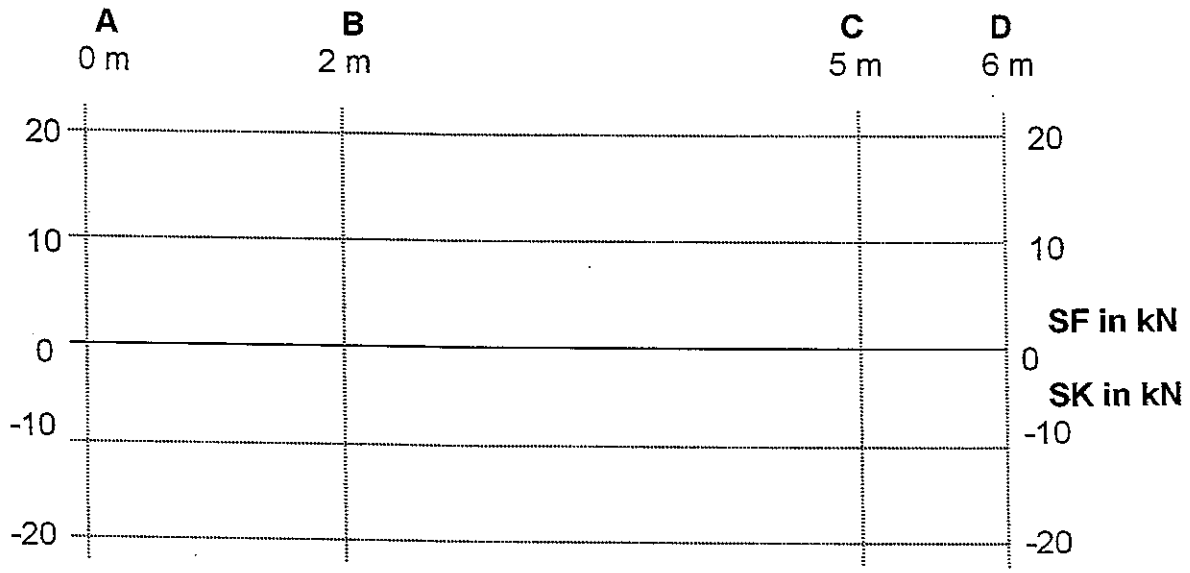
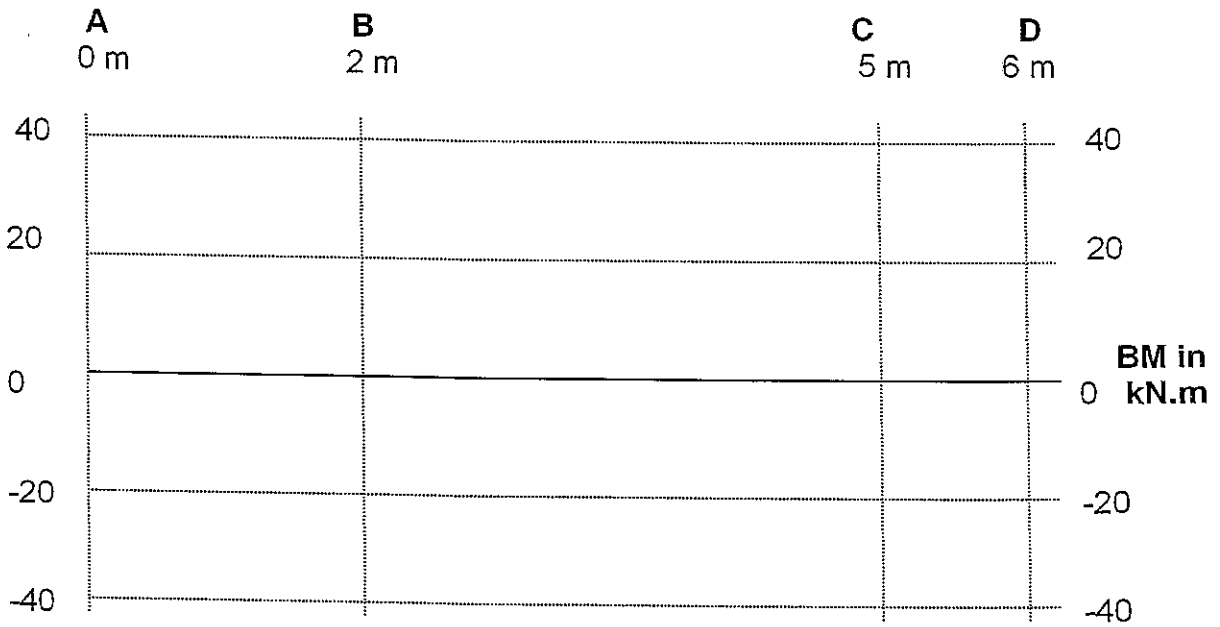
5[c] Draw the Shear Force Diagram for the beam and also give all the extreme values. **[6]**

Teken die Skuifkragdiagram vir die balk en dui ook alle ekstreme waardes aan.



5[c] Draw the Bending Moment Diagram for the beam and also indicate all extreme values. **[8]**

Teken die Buigmomentdiagram vir die balk en dui alle ekstreme waardes aan.



SCRATCHPAD / ROFWERK