



UNIVERSITEIT VAN JOHANNESBURG  
UNIVERSITY OF JOHANNESBURG



FACULTY OF SCIENCE  
FAKULTEIT NATUURWETENSKAPPE

Applied Mathematics/Toegepaste Wiskunde  
APK Campus/Kampus  
APM1A10 INTRODUCTION TO STATICS/  
APM1A10 INLEIDING TOT STATIKA  
8 JUNE 2012 / 8 JUNIE 2012

**EXAMINER  
EKSAMINATOR**

PROF CM VILLET

SECOND EXAMINER  
TWEEDE EKSAMINATOR

DR JSC PRENTICE

**TIME** 2 HOURS 30 MINUTES

**MARKS** 60

**TYD** 2 UUR 30 MINUTE

**PUNTE** 60

*Please read the following instructions carefully:  
Lees die volgende instruksies sorgvuldig deur:*

1. Answer all the questions.  
Beantwoord al die vrae.
  2. Pocket calculators are permitted.  
Sakrekenaars word toegelaat.
  3. Symbols have their usual meaning.  
Simbole het hul gewone betekenis.
  4. Results may be left in surd form.  
Resultate mag in wortelvorm gegee word.
  5. This paper consists of 4 pages including this one.  
Hierdie vraestel bestaan uit 4 bladsye, hierdie een ingesluit.
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**COURSE:** APM1A10  
**TIME:** 2½ HOURS  
**MARKS:** 60

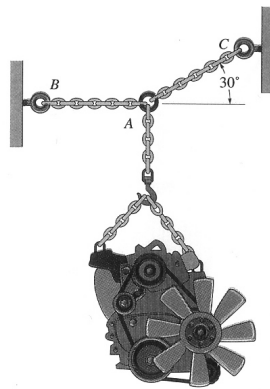
**KURSUS:** APM1A10  
**TYD:** 2½ URE  
**PUNTE:** 60

**QUESTION 1**

(a) In terms of  $P$ , determine the maximum weight of the engine that can be supported without exceeding a tension of  $10P$  in cable  $AB$  and  $11P$  in cable  $AC$ . (7)

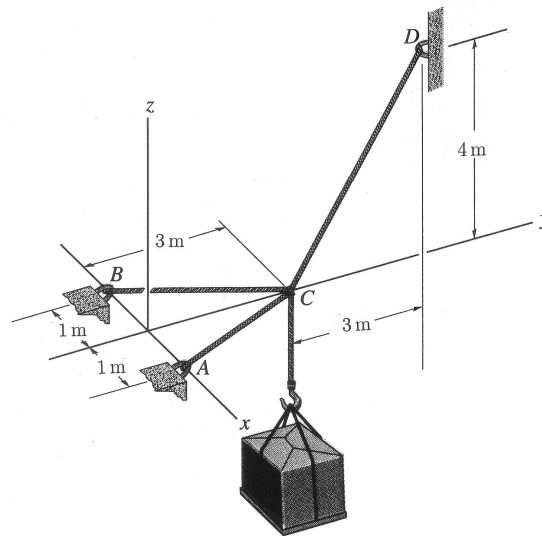
**VRAAG 1**

(a) Bepaal, in terme van  $P$ , die maksimum gewig van die enjin wat ondersteun kan word sonder om 'n trekkrags van  $10P$  in kabel  $AB$  en  $11P$  in kabel  $AC$  te oorskry. (7)



(b) In terms of  $W$ , determine the force in each cable needed to support the  $4W$  load. (11)

(b) Bepaal, in terme van  $W$ , die krag benodig in elke kabel om die  $4W$  las te ondersteun. (11)



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**KURSUS:** APM1A10  
**TYD:**  $2\frac{1}{2}$  URE  
**PUNTE:** 60

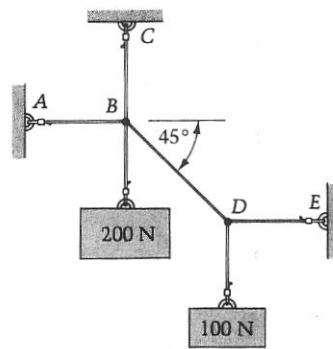
**COURSE:** APM1A10  
**TIME:**  $2\frac{1}{2}$  HOURS  
**MARKS:** 60

**QUESTION 2**

**VRAAG 2**

(a) The two weights are supported by six light, inextensible cords. Find the forces in all the cords. (10)

(a) Die twee gewigte word ondersteun deur ses ligte, onrekbare toue. Vind die kragte in al die toue. (10)

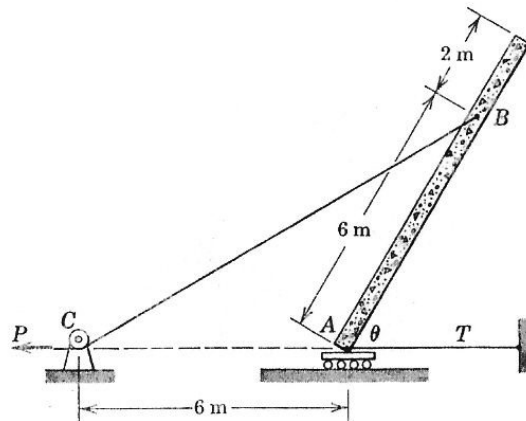


(b) The uniform concrete beam (weight  $W$ ) is lowered slowly with the help of two cables which are respectively fixed to the cable at  $A$  and  $B$ . Each of the cables can yield a maximum tensile force of  $3W$ .

(b) Die uniforme betonbalk (gewig  $W$ ) getoon word stadig laat sak met behulp van twee kables wat respektiewelik by  $A$  en  $B$  aan die balk vasgemaak is. Die breekkrag van beide kables is  $3W$ .

- (i) Will the cables resist the weight, and if not, which one will break first?
- (ii) If a cable breaks, at which stage will this happen? (12)

- (i) Sal die kables hou, en indien nie, watter een sal eerste breek?
- (ii) Indien 'n kabel breek, op watter stadium sal dit gebeur? (12)



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**COURSE:** APM1A10  
**TIME:** 2½ HOURS  
**MARKS:** 60

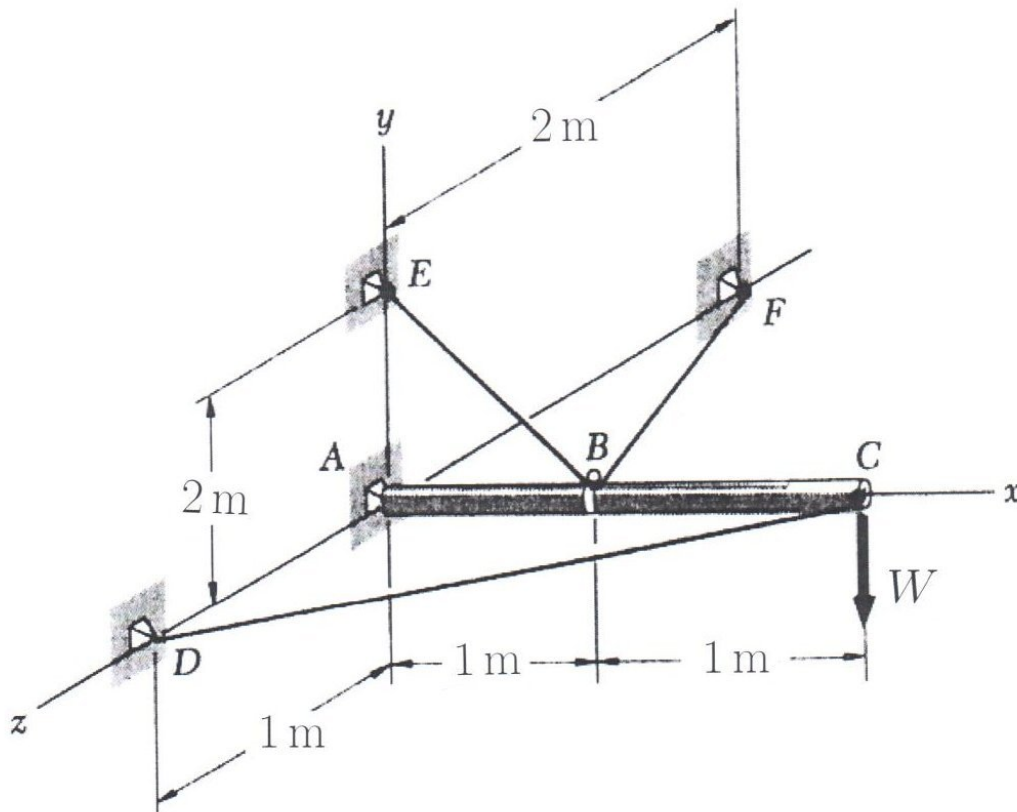
**KURSUS:** APM1A10  
**TYD:** 2½ URE  
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**QUESTION 3**

The 2 m boom carries a load  $W$  at  $C$  and is held by a ball and socket at  $A$  and by two cables  $EBF$  and  $DC$ ; the cable  $EBF$  passes around a frictionless pulley at  $B$ . In terms of  $W$ , determine the tension in each cable as well as the magnitude of the reaction at  $A$ .

**VRAAG 3**

Die 2 m-lange balk dra 'n las  $W$  by  $C$  en word ondersteun deur 'n bal-en-potjie by  $A$  en deur twee kables  $EBF$  en  $DC$ ; die kabel  $EBF$  gaan oor 'n wrywingslose katrol by  $B$ . Bepaal, in terme van  $W$ , die trekkrag in elke kabel sowel as die grootte van die reaksie by  $A$ .



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