higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AUGUST EXAMINATION

BUILDING AND STRUCTURAL CONSTRUCTION N5

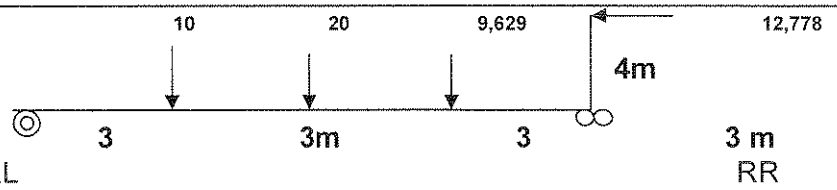
31 JULY 2014

This marking guideline consists of 9 pages.

MASHELE B B CM
LEKALAKA S M I M

QUESTION 1: FRAME WORK

1.1



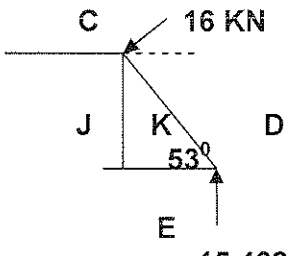
.Take moments at RL; ACM = CW
. (R x 12)+(15,973 x 4) = (10 x 3)+(20 x 6)+(12,036 x 9) √√
. **R_R = 15,462 KN** √√√
.
.Take Moment at RR; Cw = ACW
. (L x 12) = (10 x 9)+(20 x 6)+(12,036 x 3)+(15,973 x 4) √√

R_R is on rollers, thus the force is Vert up, = 15,462 KN √
.But R_L is fixed; thus we use Pythagoras to find the **Result** or Equilibrium, F
. $R_L = \sqrt{\sum Vc + \sum Hc}$

12,778 go Left,
We need 15,973 to the Right to balance √

. $R_L = \sqrt{(24,167^2 + 12,778^2)}$ √√
. **R_L = 27,337 KN** √
.
.To find the direction use Tan,
. $\text{Tan } Ø = \frac{24,167}{12,778}$ √
. **Ø = 62,133^0** √ to the horizontal (or S from W) √ (10)

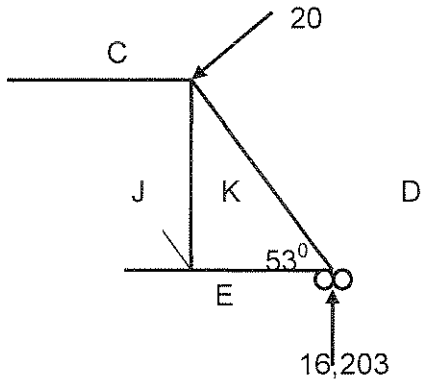
To find the members Analytical (work around nodes)



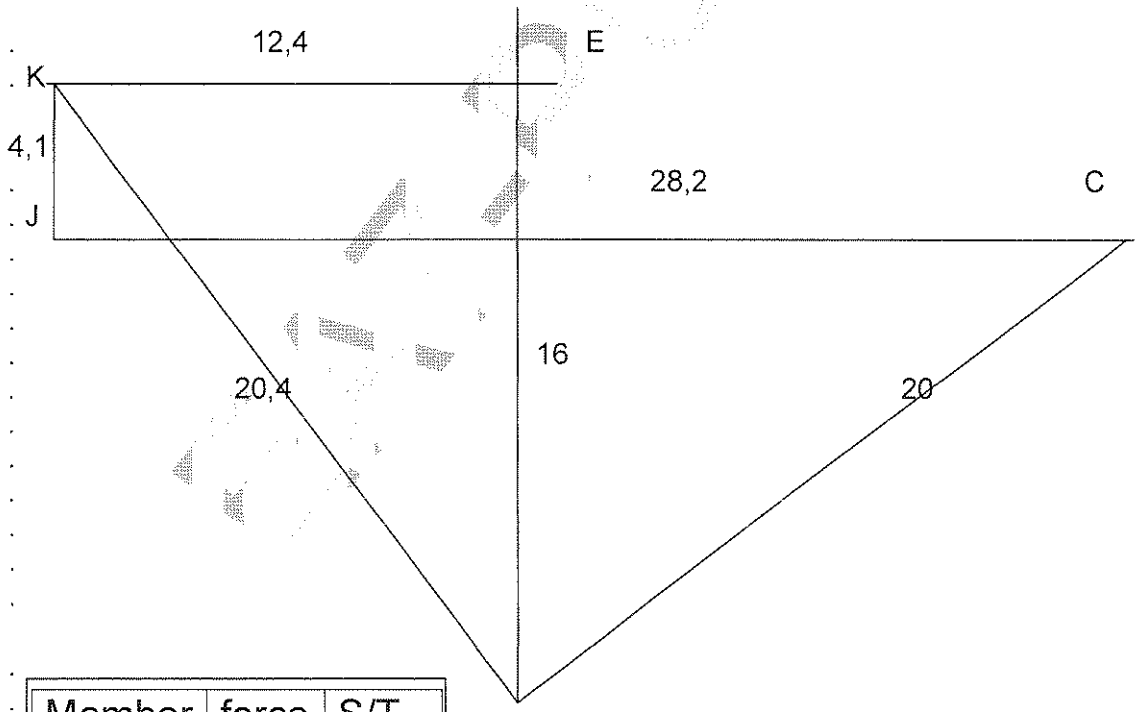
.Find member, DK
. -15,462 = DK x Sin 53^0
. **DK = - 19,361 KN strut** √√
.
.Find member, EK;
. +EK – 19,361 x Cos 53^0 = 0
. +EK = + 19,361 x Cos 53^0
. **EK = +11,652 KN Tie** √√
.Find member, CJ
. +CJ = -20 x Cos 37^0 – 19,361 x Cos 53^0
. **CJ = -27,624 KN strut** √√
.Find member, JK;
. +JK – 19,361 x Sin 53^0 = -20 x Sin 37^0
. +JK = + 19,361 x Sin 53^0 – 20 x Sin 37^0
. **+JK = + 3,426 KN Tie** √√ (8) **[10+8=18]**

OR 8 marks for graphical method

Graphical solution



Space Diagram
Scale 1:2



Member	force	S/T	
DK	20,4	S	√√
EK	12,4	T	√√
CJ	28,2	S	√√
JK	4,1	T	√√

4 + 4 = 8

QUESTION 2

1. Force = f_s x Area √
   = 100 x 5 x π x 8^2 √

   = 100,53 KN √√ (4) force + unit

2. Force = f_s x Area √
   = 100 x 4 x π x 10^2 √

   = 125,664 KN √√ (4) force +unit

Thus safe load is the smallest, = 100,53 KN √√ **[10]**

QUESTION 3: CENTROIDS

	Area	Y-Dist	A x Y	I_{xx}	$\frac{bh^3}{12}$	Dist to NA (d)	A x d^2
1 △	A=½BxH + 8100	60	486000	$\frac{bh^3}{36}$	14580000	17	2340900
2 ▭	A=LxB 27000	90	24300000	$\frac{bh^3}{12}$	72900000	13	4563000
3 △	A=½BxH + 8100	60	486000	$\frac{bh^3}{36}$	14580000	17	2340900
4 ○	A= π r^2 - 1963,5	125	- 245437,5	1/4 π r^4	- 306796,128	48	- 4523904
	Σ 41236,5 √		Σ 3156562,5 √		Σ 101753203 √		Σ 4720896 √

Check die calculations

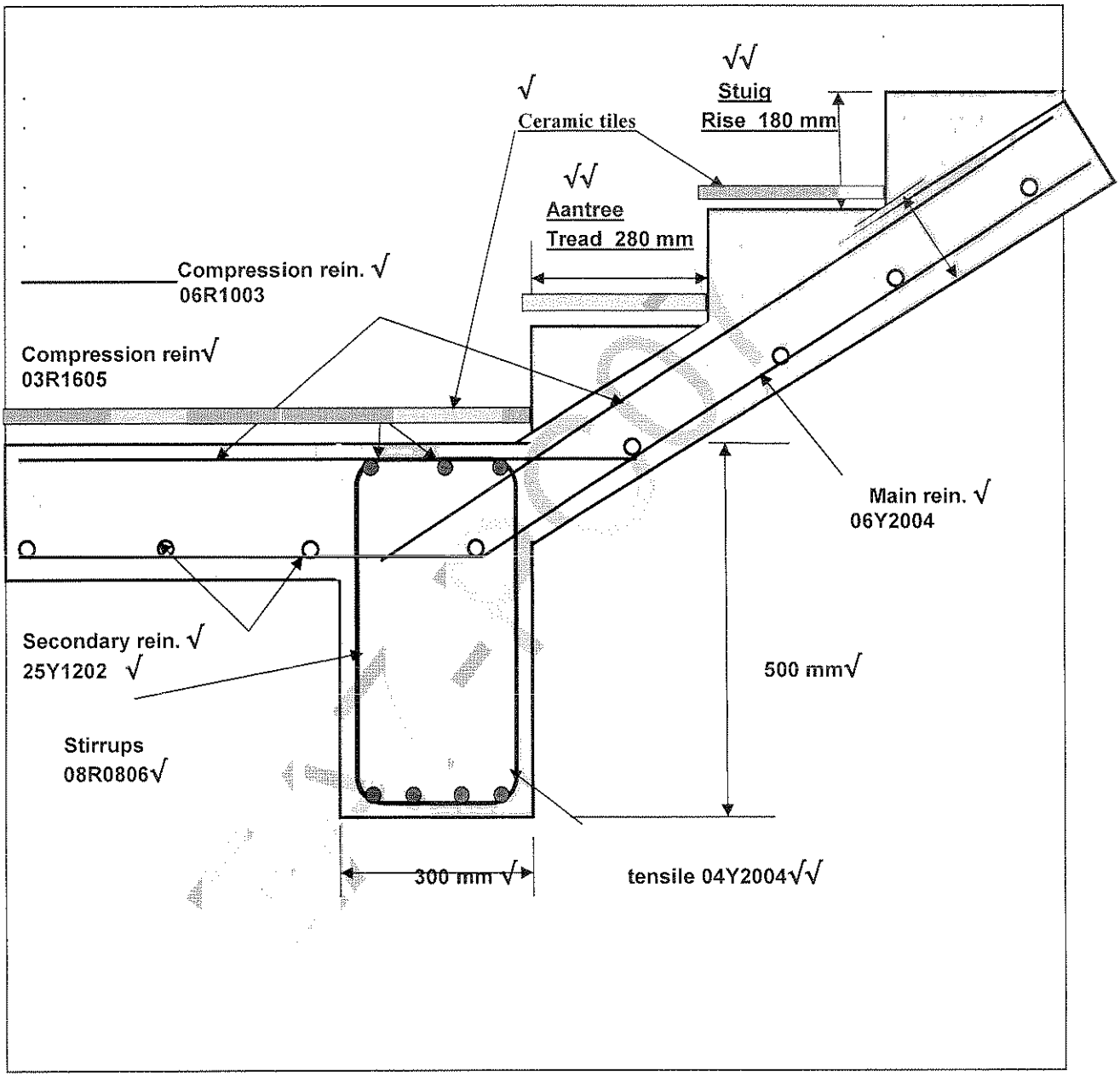
2.1 $\sum A \times Y\surd$
$Y = \sum A \surd$
$Y = 3156562,5$
$41236,5\surd$
$Y = 76,548 \text{ mm } \surd$ (4)

2.2 $Ixx = \sum (INA + Ad^2)$
$= 101753203 + 4720896 \surd$
$= 106474099,8 \text{ mm}^4 \surd$
$Ixx = 106,474 \times 10^6 \text{ mm}^4$ (2)

2.3 $Z = {}^{I}/_{Y}$
$Z = \frac{106,474 \times 10^6}{77} \surd$
$Z = 1382779,221 \text{ mm}^3 \surd\surd$ (3)

2.4 BMomax = stress x Ze√
$= 245\text{MPa} \times 1382779,221 \text{ mm}^3 \surd$
$= 338,781$ KNm √ (3)
[16]

QUESTION 4



[18]

CORRECT NESS	4
LABELLING	10
DIMENSIONS	4

QUESTION 5: REINFORCING DOCUMENTATION

A	B	C	D	E	F	G	H				
Member								Bending dimensions			
	Bars per member	No of member	Total bars	Type/ diameter	Bar mark	Shape code	Total length	A	B	C	D
Beam	4	6	24	Y16	25	32	900	600			
Beam	6	6	36	R8	26	32	1200	800			
	1√√	2√√	2√√	4√√√√	2√√	2√√	2√√	2√√	=17%		

5.2 Use the information below to complete the bending schedule, above, for the steel reinforcement in the beams in a construction project.

5.2.1 The bars must be cut according to the shape code 32 (2)

5.2.2 You need bars for six beams. Each beam must have 4 high-yield steel 16 mm bars and 6 plain mild steel 8 mm bars. (8)

5.2.3 Each of the 16 mm bars must have a straight length of 600 mm. The unbent length of these bars must be 900 mm. (2)

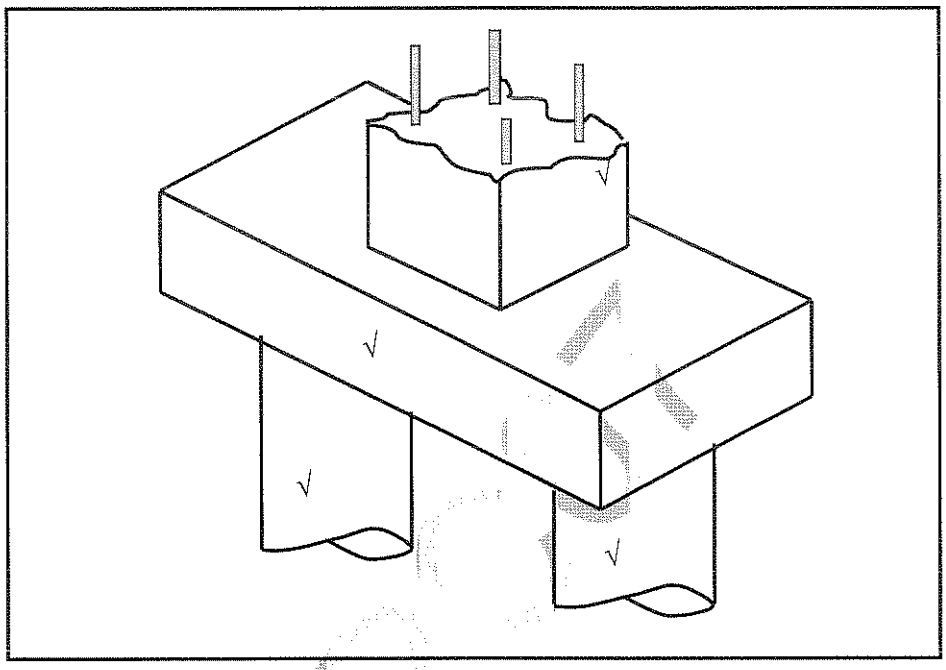
5.2.4 Each of the mild steel bars must have a straight length of 800 mm. The unbent lengths of these bars must be 1 200 mm. (2)

5.2.5 The high-yield bars have a bar mark of 25. The bar mark for the mild steel bars is 26. (2)

5.2.6 Calculate the total bars for each type. (2)
[18]

QUESTION 6

6.1

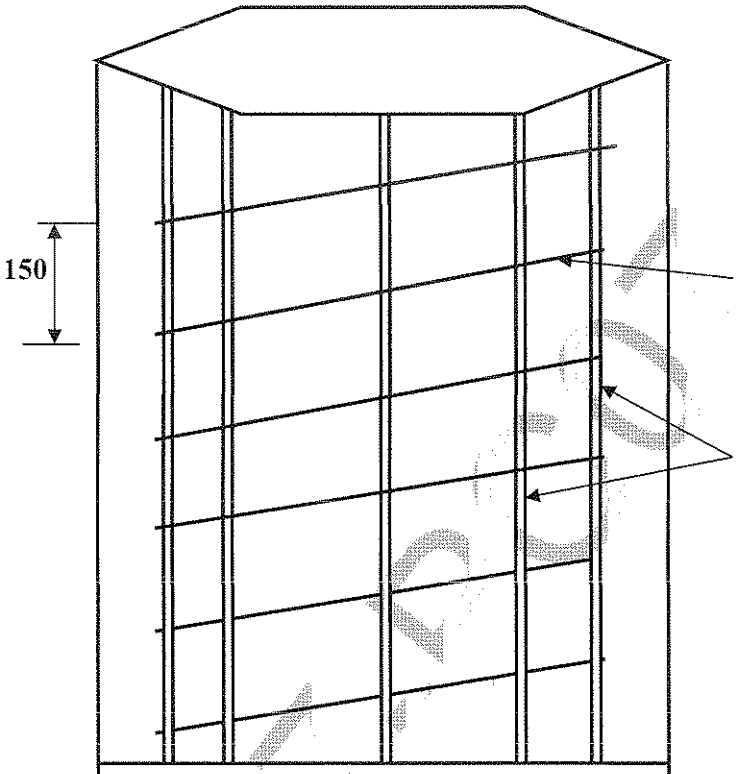


(4)

6.2
- at an old dump where = unstable soil (previously disturbed soil)√√
- natural deep soft soil = natural unstable√√
- inside a river to support a bridge column√√
- Where it is difficult to construct a normal foundation,,

(Any other valid reason will be excepted) (Any 3 x 2) (6)
[10]

QUESTION 7

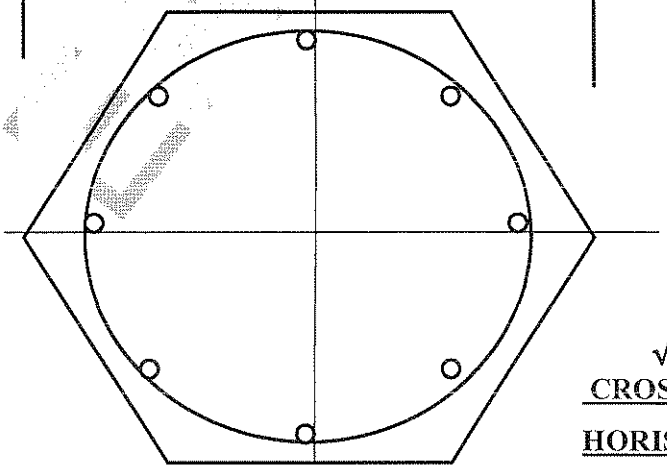


√√
R6-150 Spiraal Binders
Helical Reinforce

√√
8Y20 Hoofbewapening
Main Reinforcing

SECTIONAL FRONT VIEW -=- SNIT VOORAANSIG √√

√√



√√
CROSS-SECTIONAL VIEW
HORISONTALE SNIT

5+5=10

[10]

TOTAL: 100