higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

BUILDING SCIENCE N2

1 APRIL 2014

This marking guideline consists of 7 pages.

QUESTION 1

1.1. Ratio between the density of the specific substance✓ and the density of pure water✓ at 4 °C✓ (3)

1.2 Capillary action is the rising of liquids✓ such as water and oil that can wet the surfaces (extra bonus mark if added✓) through the fine pores of certain solid substances✓ (2)

1.3 Thermal/Heat capacity of a material is the quantity of heat energy✓ required to raise the temperature✓ of the body by 1°C or 1 K✓ (3)

1.4 Torque is the effect of a force on an object fixed at a turning point✓ that will produce rotation movement about that fixed point.✓ (2)
[10]

QUESTION 2

2.1 The working principles of a hydrometer is that all floating objects will displace its own weight in a liquid.✓
Hydrometers will therefore float at different levels in different fluids.✓
This variety in depth of floating can be celebrated to indicate the density of a specific fluid.✓ (3)

2.2 The bubbles are caused by water penetrating the pores in the brick✓and displacing the air inside the pores. ✓ (2)

2.2.1 Bricks are baked and during this process heat drives the moisture out.✓
This leaves hollows (pores) behind.✓ (2)

2.2.2 Shrinking wood cells leave vacuums✓ when the sap in the wood dries out.✓ (2)

2.3 First determine volume of pores
volume = $Bulk\ volume - Solid\ volume$✓
v = 5,46 cm³ – 4,02 cm³ √
v = 1,44 cm³✓

Now determine saturation coefficient

$$saturation\ coefficiant = \frac{volume\ of\ water\ absorbed}{bulk\ volume - solid\ volume}$$✓

$$s\ co = \frac{1{,}30\ cm^3}{1{,}44\ cm^3}\ \surd$$

$$saturation\ coefficiant = 0{,}903$$✓ (6)
[15]

QUESTION 3

3.1 Only very durable materials are selected for use in exposed areas.✓
All possible precautions are taken to reduce absorption of water by any exposed features.✓ (2)

3.2 A heat source will raise temperature of the water at the bottom of the cylinder.✓
Convection current will circulate the hot water to the top.✓
Cold water will replace the raised hot water.✓
A thermostat would control the temperature levels in the cylinder.✓ (4)

3.3 Heat required = $m \times \Delta t \times SHC$✓
700kJ = $m \times (90 - 60) \times 4{,}2kJ/kg^{\circ}C$✓
m = 700✓
30 x 4,2
Mass of water = 5,56kg✓ (4)
[10]

QUESTION 4

4.1 The extent to which a roofing material allows water to pass through it is called its permeability.✓ (1)

4.2 No – corrugated iron will not be suitable.✓
It rusts easily✓ and the maintenance is high.✓ (3)

4.3

ROOF COVERING	DURABLE	HAIL RESISTANT	HEAVY
Clay tiles	Yes✓	Fair✓	Yes✓
Glass fibre sheets	Yes✓	Fair✓	No✓
Slate tiles	Yes✓	Fair✓	Yes✓
Thatch	No✓	Yes✓	No✓

(12 x ½) (6)
[10]

QUESTION 5

5.1 Take moments about R
$\sum CM = \sum ACM$✓
(Lx10) + (6x2 = (2x8) + (8x11)
✓✓✓✓
10L = 16 + 88 – 12✓
L = 92/10✓
L = 9,2✓

Take moments about R
$\sum CM = \sum ACM$ ✓
(Rx10) + (8x1) = (2x2) + (6x12)✓✓✓✓
10R = 4 + 72 – 8✓
R = 68/10✓
R = 6,8✓

Control:
$\sum \uparrow F = \sum \downarrow F$✓
9,2 + 6,8 = 8 + 2 + 6✓✓
16 = 16✓

(20 x ½) (10)

5.2 Add mass of beam to UDL✓
8 + (10x13) = 138kN✓✓

Take moments about R
$\sum CM = \sum ACM$✓
(Lx10) = (138x4.5)✓✓
L = 621/10✓
L = 62.1✓

Take moments about R
$\sum CM = \sum ACM$✓
(Rx10) = (138x5.5)✓✓
R = 759/10✓
R = 75.9✓

Control:
$\sum \uparrow F = \sum \downarrow F$✓
962.1 + 75.9 = 138✓✓

(16 x ½) (8)
[18]

QUESTION 6

6.1 Area of section:

A = l x b = 120 x 20 = 2 400 units²✓
B = l x b = 100 x 20 = 2 000 units²✓
C = l x b = 60 x 20 = 1 200 units²✓
D = l x b = 50 x 25 = 1 250 units²✓
E = l x b = 100 x 20 = 2 000 units²✓
F = l x b = 130 x 20 = 2 600 units²✓
True area of section = $\sum$ of areas = 11 450 units²✓
ONLY CALCULATED RESULT WILL BE CONCIDERED

6.2 Centroid from A-B :

A = ½ x 20 = 10 units✓
B = ½ x 20 + 20 = 30 units✓
C = ½ x 20 + 40 = 50 units✓
D = ½ x 50 + 60 = 85 units✓
E = ½ x 20 + 110 = 120 units✓
F = ½ 'x 20 + 130 = 140 units✓
ONLY CALCULATED RESULT WILL BE CONCIDERED

6.3 Moment of area = area x distance from axis✓
A = 2400 x 10 = 24 000 units³✓
B = 2000 x 30 = 60 000 units³✓
C = 1200 x 50 =60 000 units³✓
D = 1250 x 85 =106 250 units³✓
E = 2000 x 120 = 240 000 units³✓
F = 2600 x 140 = 364 000 units³✓
True moment of section = ∑ of moments = 854 250 units³✓
ONLY CALCULATED RESULT WILL BE CONCIDERED

6.4 $y = \frac{\Sigma My}{\Sigma A}$✓
= 854 250 units³
11 450 units²✓
= 74,6 units from A-B✓
ONLY CALCULATED RESULT WILL BE CONCIDERED

(24 x ½) (12)
[12]

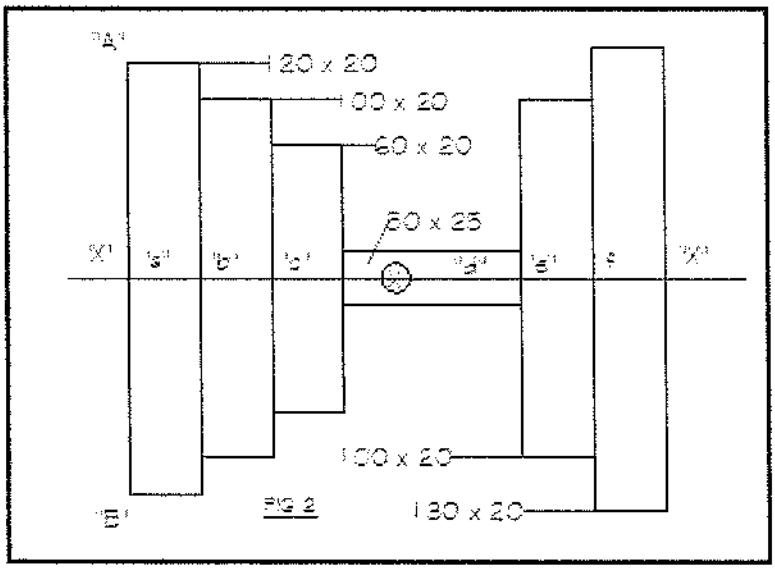
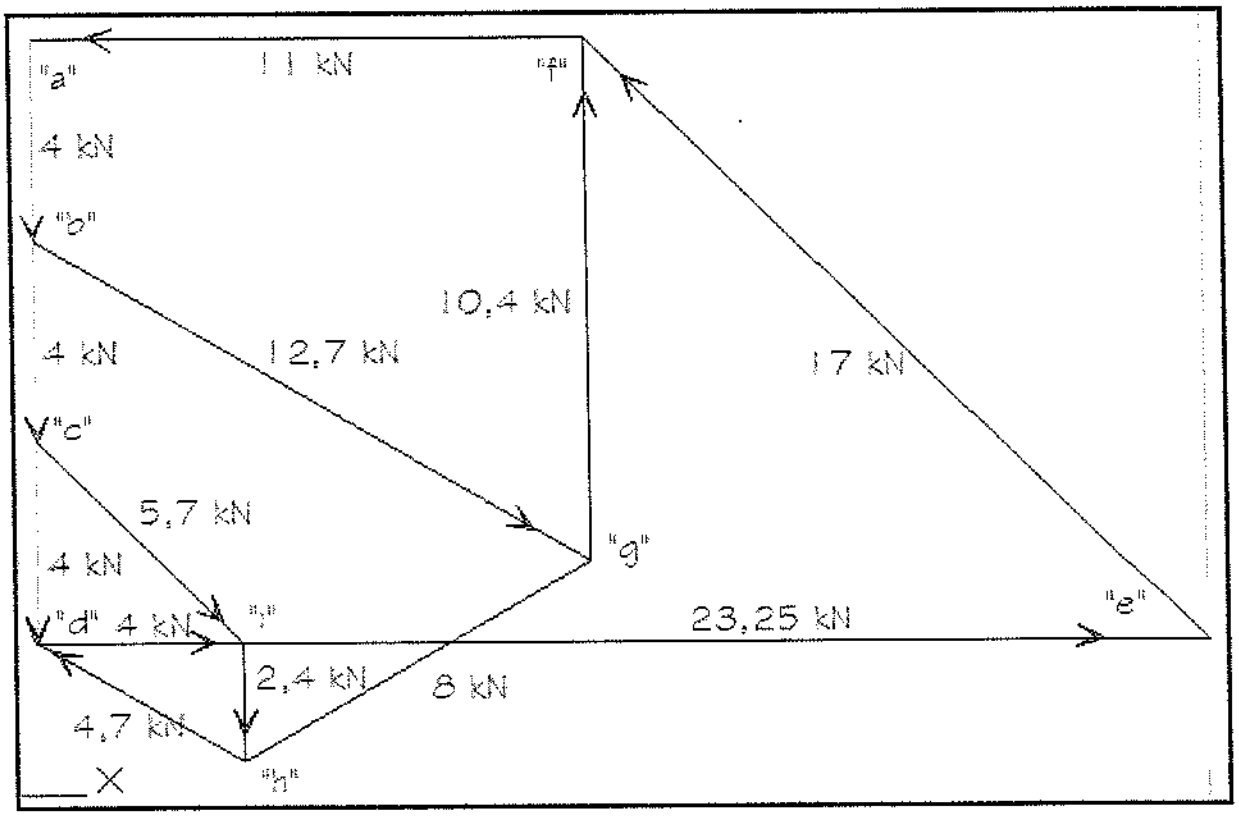


FIG 2

QUESTION 7

7.1 Use a scale of 1 kN = 1cm. Draw and measure – graphical drawing accurate to 5% of memo values will be acceptable.



VECTOR DIAGRAM

- 10 members drawn in the vector diagram = 1 mark each
- Showing the magnitudes in the vector diagram = ½ mark each x 10 = 5 marks

(15)

7.2 Copy table and populate – loads net required in table

MEMBER	MAGNITUDE	NATURE	
	(kN)	TIE	STRUT
a-b	4.0 LOAD		
b-g	12.7	X	
g-f	10.4		X
b-c	4.0 LOAD		
c-i	5.7	X	
i-h	2.4		X
h-g	8.0		X
c-d	4.0 LOAD		
d-h	4.7		X
d-e	23.25		X
e-f	17.0	X	
f-a	11.0	X	
d-i	4.0		X

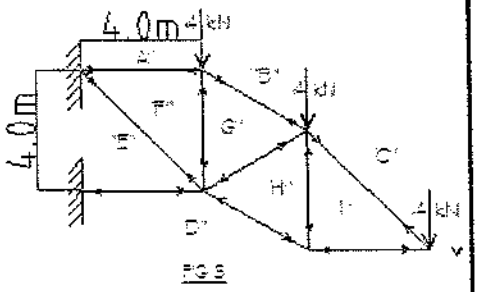


FIG 6

- Showing the nature of the 10 members in space diagram = ½ mark each x 10 = 5 marks
- Filling in the table showing magnitudes and nature = ½ mark each x10 = 5 marks

(10)

[25]

TOTAL: 100