

# higher education & training

Department:  
Higher Education and Training  
REPUBLIC OF SOUTH AFRICA

## MARKING GUIDELINE

NATIONAL CERTIFICATE

AUGUST EXAMINATION

BUILDING SCIENCE N2

29 JULY 2014

This marking guideline consists of 7 pages.

**QUESTION 1**

- 1.1 Nitrogen ✓  
Oxygen ✓  
Argon ✓  
Carbon dioxide ✓ (Any 3 x 1) (3)
- 1.2 Centrifugal pumps need a vacuum to operate; ✓✓  
positive air pressure ✓ will destroy the vacuum and render the pump useless for  
lifting liquids. ✓ (4)
- 1.3 4 °C ✓ (1)
- 1.4 Water will expand when it changes phase ✓ freezing or boiling. ✓ (2)
- 1.5 Solid ✓  
Liquid ✓  
Gas ✓ (3)
- 1.6 Heat energy ✓ (1)
- [14]**

**QUESTION 2**

- 2.1 Temperature is the 'degree of hotness' of a body. ✓  
Heat is an amount of energy present in a body. ✓ (2)
- 2.2
- Clinical thermometer ✓
  - Alcohol thermometer ✓
  - Mercury thermometer ✓
  - Maximum/minimum limit thermometer ✓ (4)
- 2.3
- Clinical thermometer: medical use to measure body temperatures ✓
  - Alcohol thermometer: to measure very low temperatures (at the poles) ✓
  - Mercury thermometer: general industrial and domestic (weather) uses ✓
  - Maximum/minimum limit thermometer: to record highest and lowest  
temperatures over a set period ✓ (4)
- [10]**

## QUESTION 3

3.1  $Heat\ required = m \times \Delta t \times SHC$   
 $X\ kJ = 30\ kg \times (343 - 285) \times 0.394\ kJ/kg^{\circ}C \checkmark$   
 $= 30 \times 58 \times 0.394 \checkmark$   
 $Heat\ energy\ required = 685\ kJ\ or\ 685.56\ kJ \checkmark$

**Reward once for use of SI units.  $\checkmark$**  (4)

3.2 Heat lost = heat gained  $\checkmark$   
 $m \times \Delta t \times SHC = m \times \Delta t \times SHC$   
 Hot water  
 Mass = ?  
 T2 = 45  $\checkmark$   
 T1 = 85  
 SHC = 4,2  
 $Mass \times 40 \times 4,2 = 1 \times 10 \times 4,2 \checkmark$   
 $M = 4,2/16,76 \checkmark$   
 $M = 0,25\ kg$   
 Mass of hot water required = 250 g  $\checkmark$

cold water  
 mass = 1 kg  
 T2 = 45  $\checkmark$   
 T1 = 35  
 SHC = 4,2

(6)

3.3 Bricks are porous and will absorb water.  $\checkmark$   
 Water that freezes will expand.  $\checkmark$  (2)

3.4 Excessive frost will expand to crack waterlogged bricks – weakening your structure.  $\checkmark$  (1)  
**[13]**

## QUESTION 4

4.1 The cohesion force of a liquid that pulls all the molecules together is referred to as surface tension when the top surface of the liquid is exposed to another substance like air or oils  $\checkmark$  (1)

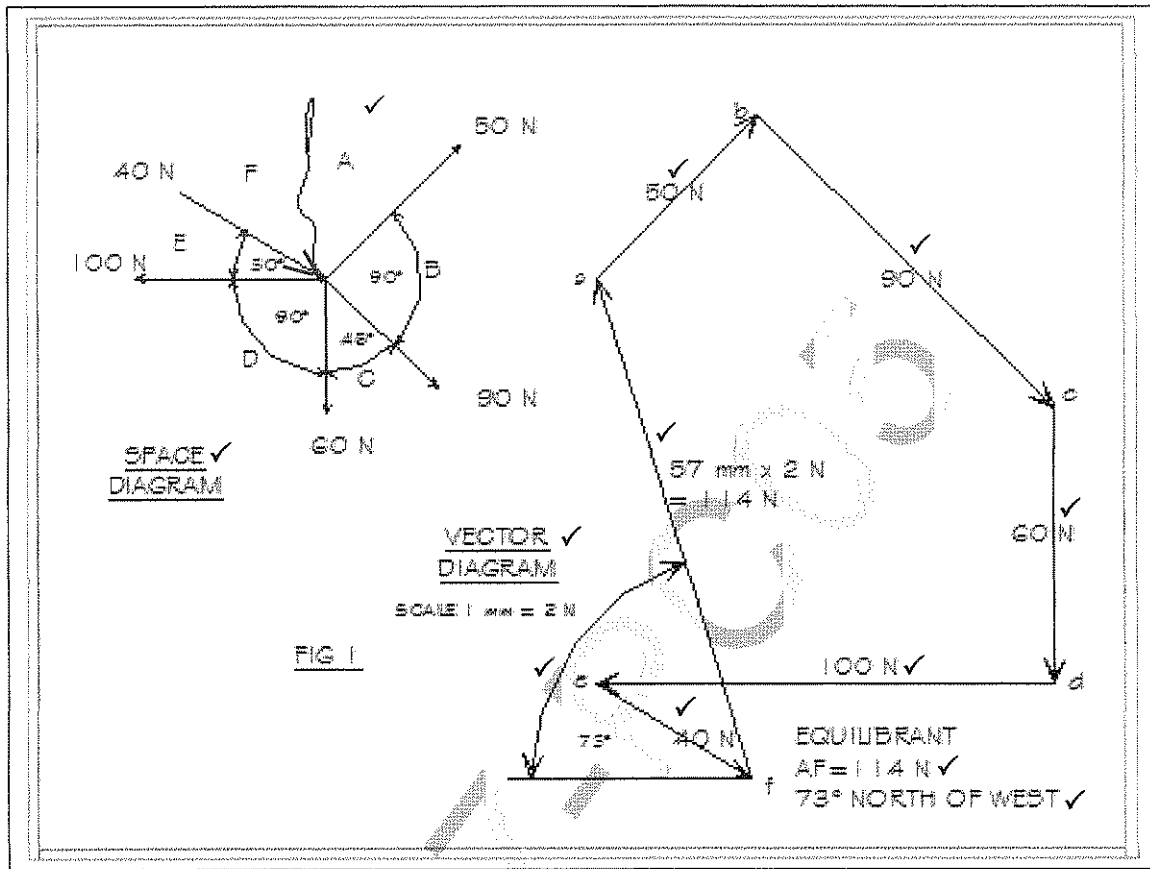
4.2  $saturation\ coefficient = \frac{volume\ of\ water\ absorbed}{bulk\ volume - solid\ volume}$   
 $Sat\ co = \frac{0.28}{0.030} \checkmark$   
 $= 9.33 \checkmark$  (2)

4.3

Roof covering	Rustproof	Hail-resistant	Economical
Corrugated iron	Fair $\checkmark$	Yes $\checkmark$	Yes $\checkmark$
Glass fibre sheets	Yes $\checkmark$	Fair $\checkmark$	No $\checkmark$
Cement fibre sheets	Yes $\checkmark$	Fair $\checkmark$	Fair $\checkmark$
Thatch	Yes $\checkmark$	Yes $\checkmark$	No $\checkmark$

(12 x ½) (6)  
**[9]**

QUESTION 5



Space diagram = 2

Vector diagram correctness = 8 x 1/2

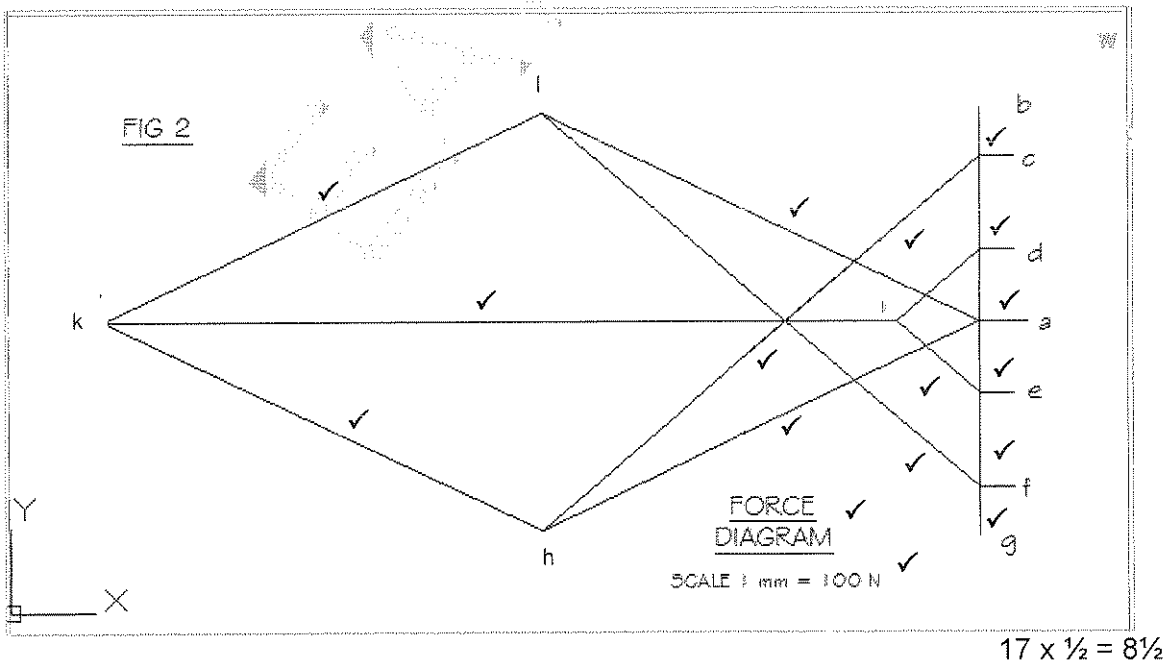
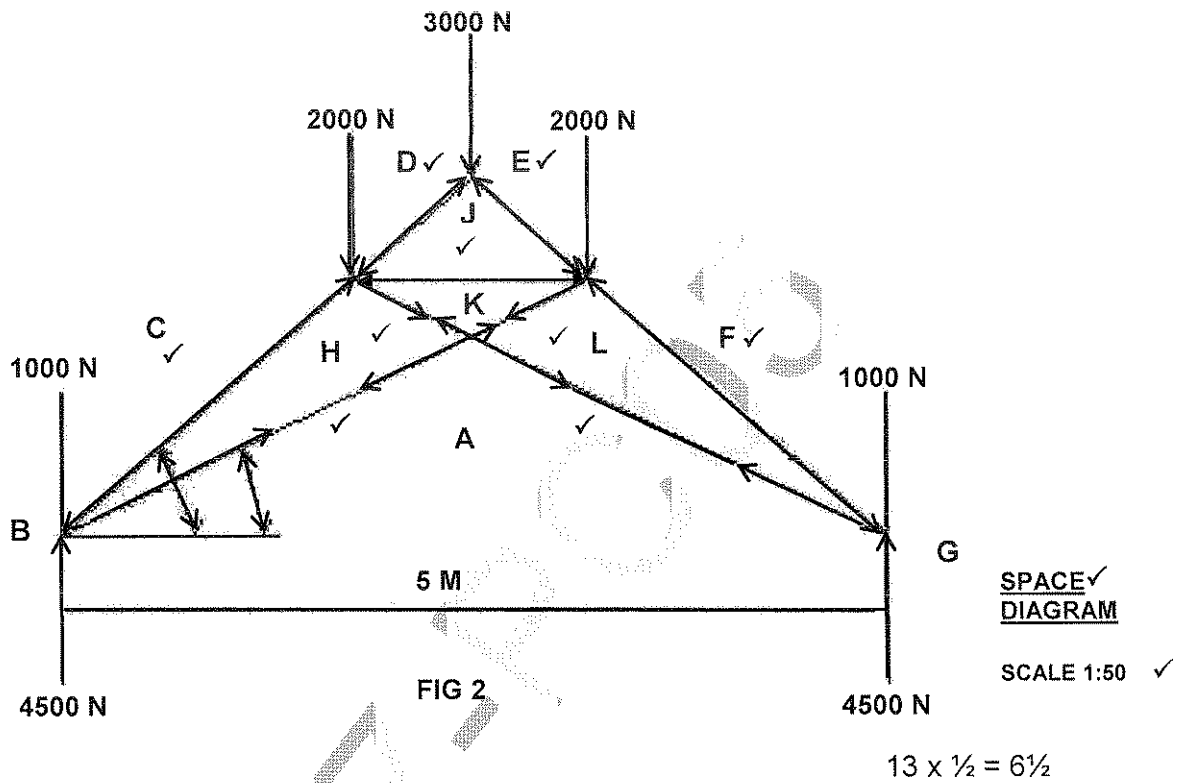
Magnitude = 1

Direction = 1

[8]

QUESTION 6

6.1



Use a scale of 1 mm = 100 N.  
Draw and measure – graphical drawing accurate to 5% of memo values will be acceptable.

(15)

MEMBER	MAGNITUDE (N)	NATURE	
		TIE	STRUT
1. CH	12 200 N ✓		X ✓
2. DJ	240 N ✓		X ✓
3. EJ	240 N ✓		X ✓
4. FL	12 200 N ✓		X ✓
5. AL	10 280 N ✓	X ✓	
6. AH	10 280 N ✓	X ✓	
7. HK	10 280 N ✓	X ✓	
8. LK	10 280 N ✓	X ✓	
9. KJ	16 820 N ✓		X ✓
10. GA	4 500 N ✓		X ✓
11. AB	4 500 N ✓		X ✓

(FIG 2)

6.2 Copy table and populate – point loads not required in table.

22 x ½ (11)

[26]

### QUESTION 7

7.1 Take moments about 'O'  
 $\sum CM = \sum ACM$  ✓  
 $(200 \times 2) = P \sin 60^\circ \times 3,5$  ✓✓✓✓  
 $P = 131,97 \text{ N}$  ✓

(6)

7.2 Take moments about 'O' ✓  
 $\sum CM = \sum ACM$  ✓  
 $(10 \times 3,5 \times 1,75) = P \sin 60^\circ \times 3,5$  ✓  
 $P = 20,21 \text{ N}$  ✓

(4)  
 [10]

## QUESTION 8

	AREA L x B mm <sup>2</sup>	DISTANCE TO XX (LEVER ARM)	AREA x DISTANCE	$Y = \frac{\Sigma MY}{\Sigma A} \checkmark$
A	80 x 72 = 5760 mm <sup>2</sup>	36 mm	207360 mm <sup>3</sup> ✓	
B	12 x 25 = 300 mm <sup>2</sup>	(12 x ½) + 60 = 66 mm	19800 mm <sup>3</sup> ✓	
C	25 x 24 = 600 mm <sup>2</sup>	(24 x ½) + 24 = 36 mm	21600 mm <sup>3</sup> ✓	
D	25 x 12 = 300 mm <sup>2</sup>	6 mm	1800 mm <sup>3</sup> ✓	$\frac{250560}{6960} \checkmark$ $y = 36 \text{ m} \checkmark \checkmark$
	$\Sigma A = 6960 \text{ m}^2$ ✓		250560 mm <sup>3</sup> ✓	

[10]

TOTAL: 100