

higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

**NATIONAL CERTIFICATE
NOVEMBER EXAMINATION
BUILDING SCIENCE N2**

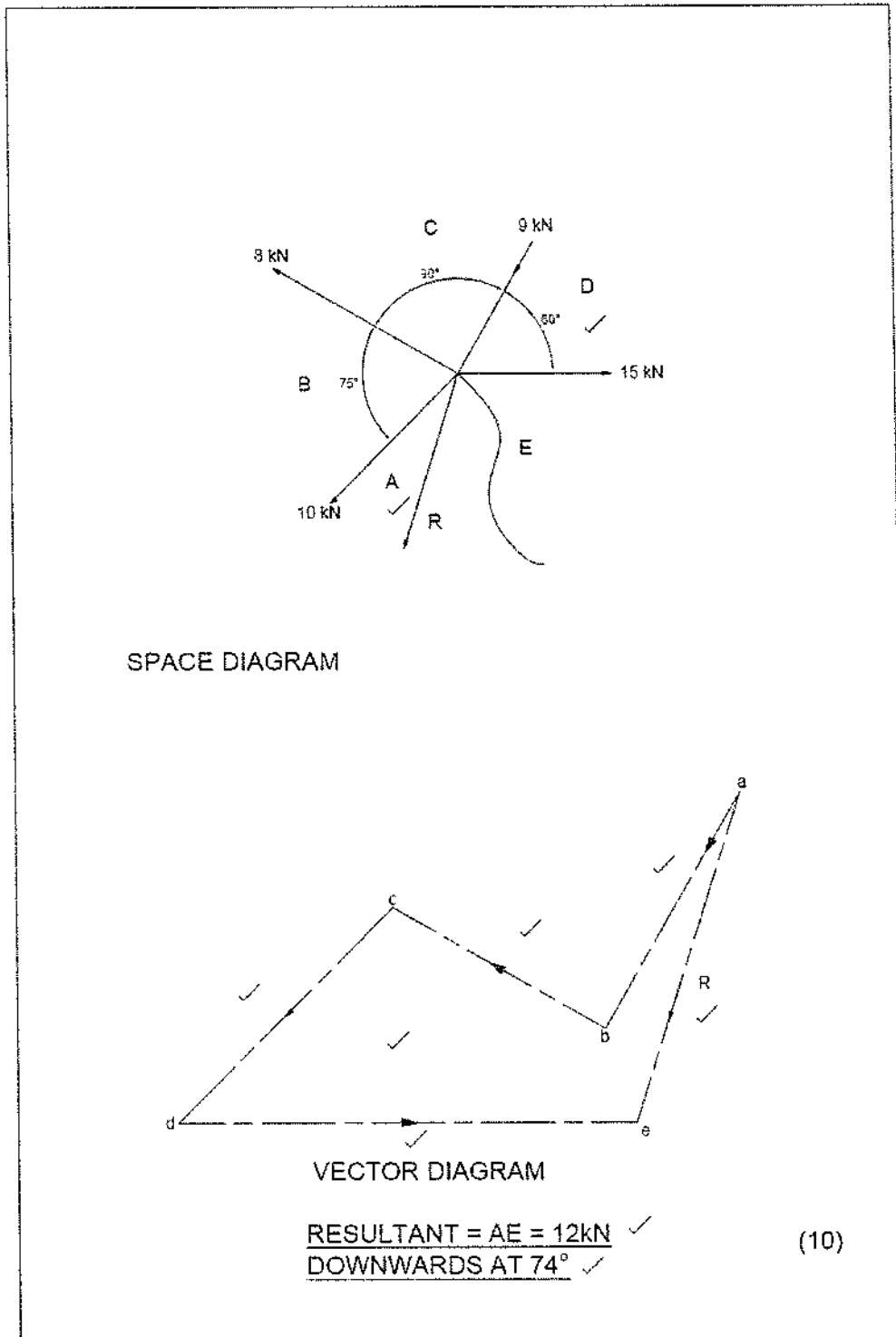
21 NOVEMBER 2013

This marking guideline consists of 7 pages.

QUESTION 1

- 1.1 1.1.1 When a single force keeps a system of forces at rest, that single force is called the equilibrant. (2 × 1) (2)
- 1.1.2 When a single force can be found to replace a number of forces that single force is called the resultant. (2 × 1) (2)

1.2



[14]

QUESTION 2

2.1 When two equal parallel forces are working in opposite direction it is known as a couple. (2 × 1) (2)

2.2

SPACE DIAGRAM
SCALE: 1 cm = 1 m

VECTOR DIAGRAM
SCALE: 1cm = 10kN

F = QR = 38 kN
O = RP = 70 kN ACTING UPWARDS AT 36°

(10)

[12]

QUESTION 3

3.1 The centre of gravity of a body/lamina is that centre in space through which the resultant pulls of the earth, the weight of the body for all possible positions of the body apply. (3 × 1) (3)

3.2

Areas	x distance from side AB	Moments about AB
$60 \times 20 = 1\,200 \checkmark$	$20 \div 2 = 10 \checkmark$	$1\,200 \times 10 = 12\,000 \checkmark$
$60 \times 30 = 1\,800 \checkmark$	$60 \div 2 + 20 = 50 \checkmark$	$1\,800 \times 50 = 90\,000 \checkmark$
$-7,5 \times 30 = \underline{-225} \checkmark$ $= 2775$	$\frac{1}{3} \times 30 + 20 = 30 \checkmark$	$-225 \times 30 = \underline{-6750} \checkmark$ $= 95\,250$
	$= \underline{95\,250} \checkmark$ $2\,775$	
	$= \underline{34,324 \text{ units}} \checkmark$	

(11)
[14]

QUESTION 4

To find R_L – Taking moments about R_R

$$\overset{\sqrt{1/2}}{(R_L \times 6)} + \overset{\sqrt{1/2}}{(9 \times 1)} = \overset{\sqrt{1/2}}{(4 \times 6 \times 3)} + \overset{\sqrt{1/2}}{(7 \times 7,5)}$$

$$6 R_L = 72 + 52,5 - 9 \checkmark$$

$$R_L = 115,5 \div 6 \checkmark$$

$$R_L = \underline{19,25 \text{ kN}} \checkmark \quad (5)$$

To find R_R – Taking moments about R_L

$$\overset{\sqrt{1/2}}{(R_R \times 6)} + \overset{\sqrt{1/2}}{(7 \times 1,5)} = \overset{\sqrt{1/2}}{(4 \times 6 \times 3)} + \overset{\sqrt{1/2}}{(9 \times 7)}$$

$$6 R_R = 72 + 63 - 10,5 \checkmark$$

$$R_R = 124,5 \div 6 \checkmark$$

$$R_R = \underline{20,75 \text{ kN}} \checkmark \quad (5)$$

[10]

QUESTION 5

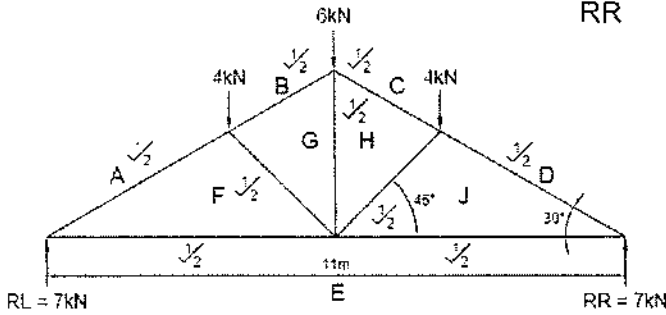
REACTIONS

$$RR + RL = 4 + 6 + 12$$

$$= 14 + 2$$

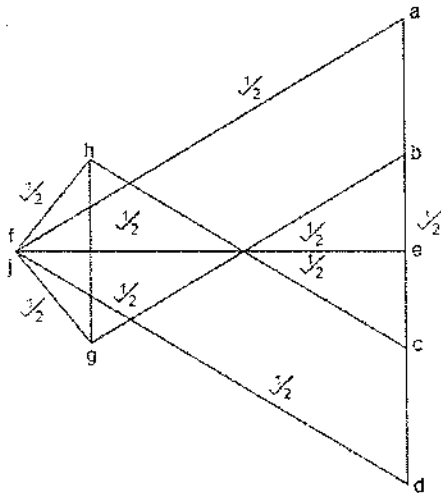
$$RL = 7\text{kN} \quad \frac{1}{2}$$

$$RR = 7\text{kN} \quad \frac{1}{2} \quad (1)$$



SPACE DIAGRAM
SCALE: 1 cm = 1 m

$$(9 \times \frac{1}{2} = 4\frac{1}{2})$$



FORCE DIAGRAM
SCALE: 1cm = 1kN

$$(9 \times \frac{1}{2} = 4\frac{1}{2})$$

(10)

MEMBER	MAGNITUDE OF FORCE	NATURE
AF	14 kN $\sqrt{1/2}$	STRUT
BG	11 kN $\sqrt{1/2}$	STRUT
CH	11 kN $\sqrt{1/2}$	STRUT
DJ	14 kN $\sqrt{1/2}$	STRUT
EF	12,25 kN $\sqrt{1/2}$	TIE
FG	3,25 kN $\sqrt{1/2}$	STRUT
GH	5,0 kN $\sqrt{1/2}$	TIE
HJ	3,25 kN $\sqrt{1/2}$	STRUT
JE	12,25 kN $\sqrt{1/2}$	TIE

(5)
[15]**QUESTION 6**

- 6.1 Heat is a form of energy which causes the molecules in a substance to vibrate and move more freely whereas (Any 2 × 1)
Temperature is the degree of hotness or coldness of a body. (Any 2 × 1) (4)
- 6.2
- Sun
 - Fuels
 - Electricity
 - Friction
 - Chemical reaction
 - Internal heat of the earth
 - Change of state of aggregation (Any 3 × 1) (3)
- 6.3
- Temperature
 - Condition
 - Dimensions
 - Colour
 - Phase
 - Composition (Any 3 × 1) (3)
- 6.4
- Convection
 - Conduction
 - Radiation (3)
- [13]

QUESTION 7

- 7.1 Density is the mass per unit volume of a substance whereas
Relative density (specific weight) is the ratio between the mass of any volume of a substance to the mass of an equal volume of water, expressed as a number. (5 × 1)

OR

Relative density expresses the number of times the material is heavier than water when comparing equal volumes of each. (5)

- 7.2 R.D = $\frac{\text{Density of material}}{\text{Density of water}}$ (density of water = 1 000 kg/m³)
 Density of material = R.D x Density of water
 Density of material = 0,8 x 1 000
 Density of material = 800 kg/m³ (0,8 g/cm³) (2)
- 7.3 R.D = $\frac{\text{Mass of material}}{\text{Mass of an equal vol. water}}$
 R.D = $\frac{4\,200\text{ kg}}{2\,000\text{ kg}}$
 R.D = 2,1 (no unit) (2)
 [9]

QUESTION 8

- 8.1 The surface of a fluid and the outside of the water drop of this cohesion causes an inward or downward attraction called surface tension (2)
- 8.2 Surface tension = $T = \frac{\rho g h r}{2}$
 $T = \frac{1250 \times 9,81 \times 0,04 \times 0,008}{2}$
 $T = \underline{1,962\text{ N/m}}$ (3)
- 8.3 Porosity is the amount of pore spaces or voids present in a material.
 OR
 Porosity is the total volume of pore spaces compared with the total volume of a body. (2)
- 8.4 % Porosity = $\frac{\text{Bulk volume} - \text{Solid volume}}{\text{Bulk volume}} \times 100$
 $\frac{7,46 - 6,20}{7,64} \times 100$
 % Porosity = 18,85 % (3)
- 8.5 Saturation coefficient = $\frac{\text{volume of the water absorbed}}{\text{Volume of the pores}}$
 $\frac{0,035}{0,42}$
 Saturation coefficient = 0,0833 (3)
 [13]

TOTAL: 100