higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING SCIENCE N2

8 April 2021

This marking guideline consists of 7 pages.

QUESTION 1

1.1 1.1.1 Joule is the work done✓ when the point of application of a force of 1 N✓ is displaced through 1 m in the direction of the force.✓

OR

A unit of energy equal✓ to the work done when a force 1 N✓ acts over 1 m. ✓

1.1.2 The heat capacity of a given mass of substance✓ is the quantity of the heat required to raise✓ the temperature of the substance by 1 K or 1 ˚C.✓

OR

Heat capacity is the measurable physical quantity✓ that characterises the amount of heat required to change✓ the temperature of the body by a given amount.✓

1.1.3 The specific heat capacity of a substance is the quantity of heat required to raise the temperature of 1 kg,✓ which is a unit mass, of a substance by 1 K or 1 ˚C, ✓ which is one temperature unit.✓

(3 × 3) (9)

1.2 $K = {}^{\circ}C + 273$ or ${}^{\circ}C = K - 273$✓
$K = 35\ {}^{\circ}C + 273$✓
$K = 308$✓ (3)

1.3 Heat added = m × s.h c × Δt
$385\ kJ = 45 \times 0{,}394 \times (t_2 - 14)$✓
$385\ kJ = 17{,}73 \times (t_2 - 14)$
$385\ kJ = 17{,}73\ t_2 - 248.22$✓
$385 + 248.22 = 17.73\ t_2$✓
$17.73\ t_2 = 633.22$
$t_2 = \frac{633{,}22}{17{,}73}$✓
$t_2 = 35{,}715\ {}^{0}C$✓ (5)

[17]

QUESTION 2

2.1 $\sum$ CW Moments = $\sum$ ACW Moments✓
$(R_L \times 6.5) = (20 \times 8) + (40 \times 4) + (35 \times 2.5) + (10 \times 0)$✓
$(R_L \times 6.,5) = 160 + 160 + 87{,}5$ ✓
$R_L = \frac{407{,}5}{6{,}5}$ ✓
$R_L = 62{,}692\ kN$ ✓ (5)

2.2 $\sum$ ACW Moments = $\sum$ CW Moments ✓

$(R_R \times 6,5) + (20 \times 1,5) = (40 \times 2.5) + (35 \times 4) + (10 \times 6,5)$✓

$(R_R \times 6,5) = 100 + 140 + 65 - 30$✓

$R_R = \frac{275}{6,5}$ ✓

$R_R = 42,308$ KN✓ (5)

2.3 $\sum$ Upwards Forces = $\sum$ Downwards Forces

(62,692 kN + 42,308 kN)✓ = (20 kN + 40 kN + 35 kN + 10 kN)✓

105 kN = 105 kN✓ (3)

[13]

QUESTION 3

3.1 Absorbent materials

- Bricks ✓
- Wood ✓
- Concrete ✓
- Limestone ✓
- Plaster ✓ (Any 3 × 1)

Non-absorbent materials

- Polythene ✓
- Slate ✓
- Dense bricks ✓
- Glass ✓
- Rubber ✓ (Any 3 × 1)

(3 × 2) (6)

3.2 A burnt clay brick has many interconnected pores or voids.✓ The raising of water✓ into these pores or voids is called capillarity.✓
Porosity refers to the pores or voids is clay bricks✓ left behind when the water in the mixture evaporates during the burning process.✓ (5)

3.3 Saturation coefficient = $\frac{\text{Volume of water absorbed}}{\text{Volume of pores}}$✓

Saturation coefficient = $\frac{1,31}{1,45}$✓

Saturation coefficient = 0,903✓ (3)

3.4 Roof covering materials

- Copper ✓
- Lead ✓
- Galvanized iron sheeting ✓
- Asbestos cement slates ✓
- Asbestos cement sheeting ✓
- Wood shingles ✓
- Natural slates ✓
- Thatch ✓
- Malthoid ✓
- Clay and concrete tiles ✓
- Glass fibre sheets ✓
- Harvey tiles ✓ (Any 5 × 1) (5)

[19]

QUESTION 4

MEMBER	4.1.1 AREA	4.1.2 METAL PLATE DISTANCE	4.1.3 AREA × DISTANCE
1	½ × 30 × 30 = - 450 mm^2✓	10 mm✓	450 mm^2 × 10 mm = - 4 500 mm^3✓
2	80 × 60 = 4800 mm^2✓	30 mm✓	4800 mm^2 × 30 mm = 144 000 mm^3✓
3	10 × 40 = - 400 mm^2✓	55 mm✓	400 mm^2 × 55 mm = - 22 000 mm^3✓
TOTALS	**= 3 950 mm^2**✓		**= 117 500 mm^3**✓✓
MARKS	(4)	(3)	(5)

(16)

4.1.4 $\dot{y} = \frac{\text{(Total area} \times \text{Distance)}}{\text{Total area}}$ ✓

$\dot{y} = \frac{117\,500\ mm^3}{3950\ mm^2}$ ✓

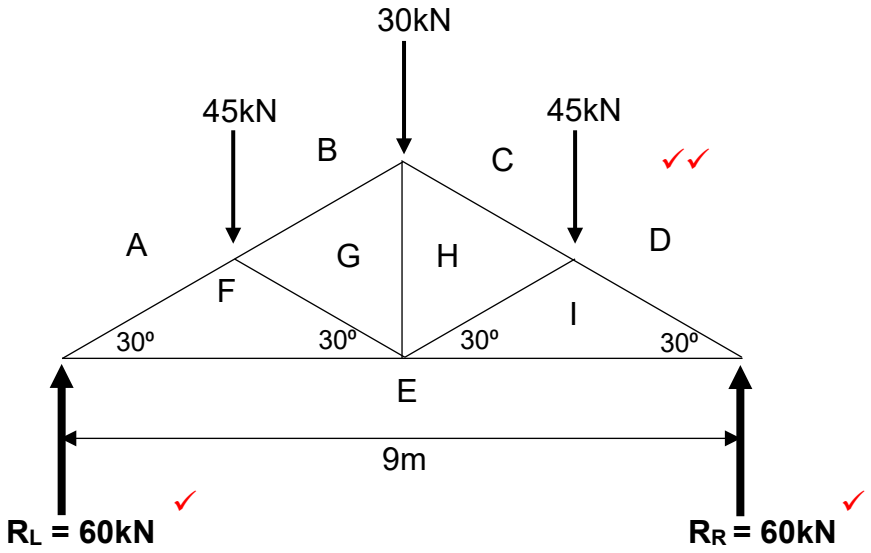
$\dot{y}$ = **29,747 mm** 'X-X'✓✓ (4)

4.2 Couple is when two parallel forces, having the same magnitude,✓ and acting at any distance in opposite directions on a lever.✓
The centroid of an object is that point✓ at which the weight of the object is set to act.✓OR The centroid is an exact centre of an object. ✓ (4)

[20]

QUESTION 5

5.1



✓✓ ✓ ✓

OR

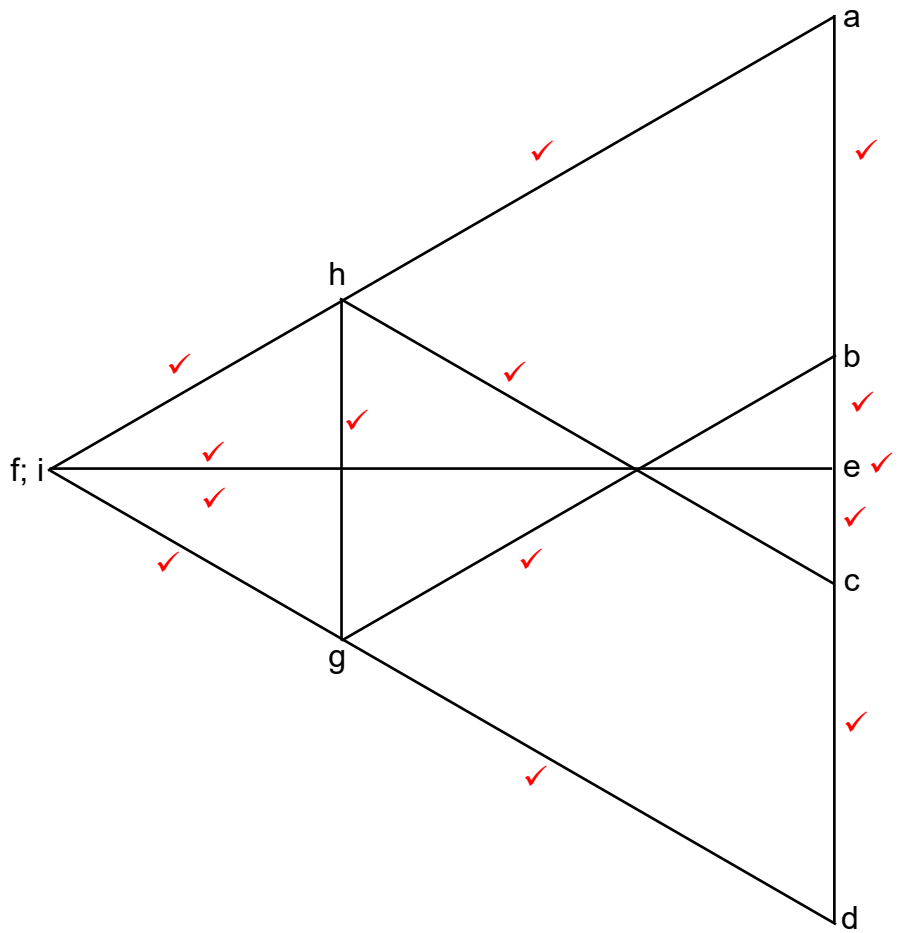
RL + RR = 45 kN + 30 kN + 45 kN

RL + RR = 120 kN

. : RL = $\frac{120\ kN}{2}$ RR = $\frac{120\ kN}{2}$

RL = 60 kN✓ RR = 60 kN✓ (4)

5.2



(14 × ½) (7)

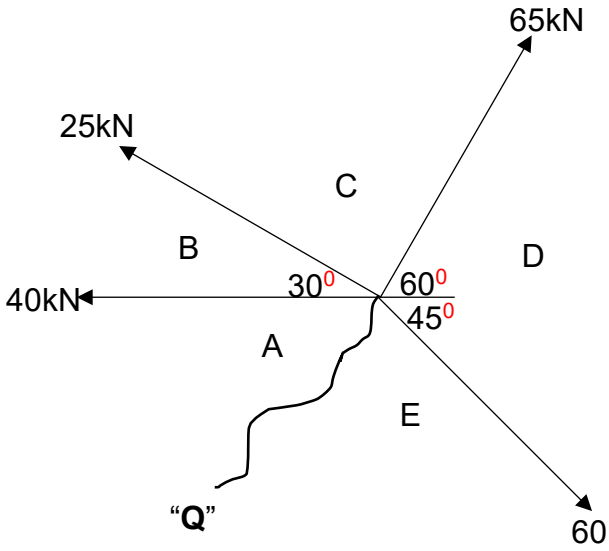
5.3

Member	Magnitude	Nature
AF	120kN✓	Strut✓
BG	76kN✓	Strut✓
CH	76kN✓	Strut✓
DI	120kN✓	Strut✓
EF	104kN✓	Tie✓
FG	44kN✓	Strut✓
GH	45kN✓	Tie✓
HI	44kN✓	Strut✓
EI	104kN✓	Tie✓

(18 × ½) (9)
[20]

QUESTION 6

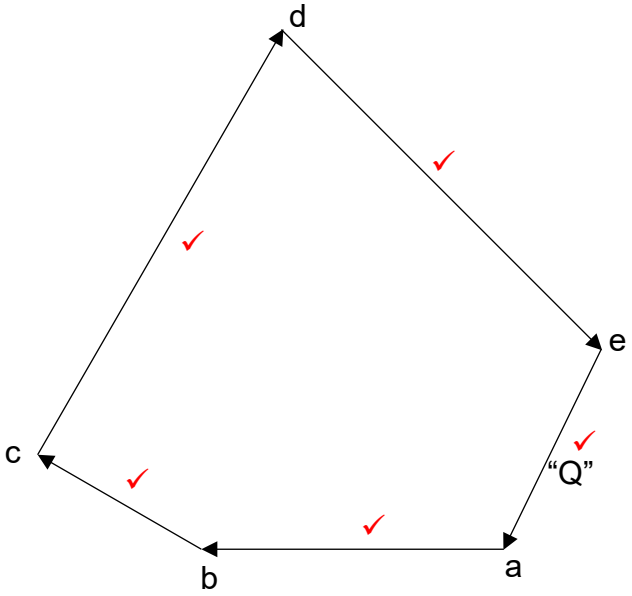
6.1



Space diagram = 1 mark✓
Bow's notation = 2marks✓✓

(3)

6.2



'Q' = 29 kN✓ @ 64°✓ South of West✓

(8)
[11]

TOTAL: 100