higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING SCIENCE N2

(15070012)

22 November 2024 (X-paper)
09:00–12:00

Drawing instruments and non-programmable calculators may be used.

This question paper consists of 4 pages, 2 diagram sheets and 1 formula sheet.

072Q1E2422

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
BUILDING SCIENCE N2
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. All sketches and diagrams must be done in pencil.
5. Assume that 1 kg of mass exerts a force 10 N.
6. Round off to THREE decimal places.
7. Write down the formula Before you start your calculations.
8. Use only a black or blue pen.
9. Write neatly and legibly.

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QUESTION 1

1.1 Define the following terms:

1.1.1 Law of moments (3)

1.1.2 Equilibrant force (3)

1.2 Explain the difference between:

1.2.1 *Coplanar* and *concurrent* (4)

1.2.2 *Centroid of a body* and *A couple* (4)

[14]

QUESTION 2

The beam shown in FIGURE 1, DIAGRAM SHEET 1 (attached) is held at equilibrium by the reactions R_L and R_R and supports four-point loads.

2.1 Take moments about R_R to calculate the magnitude of R_L. (6)

2.2 Take moments about R_L to calculate the magnitude of R_R. (6)

2.3 Test the answers to prove equilibrium. (2)

[14]

QUESTION 3

FIGURE 2 on DIAGRAM SHEET 1 (attached) shows the roof structure of a building.

3.1 Redraw the space diagram to any reasonable scale. (2)

3.2 Complete the required vector diagram to a scale of 1 mm : 1 Kn. (11)

3.3 Determine the nature and magnitude of each member in the framework and tabulate the results neatly using the table below:

MEMBER	MAGNITUDE	NATURE
AE		
BF		
CG		
DE		
DG		
EF		
FG		

(14)

[27]

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QUESTION 4

A piece of metal plate of even thickness is shown in FIGURE 3, DIAGRAM SHEET 2 (attached). The compound section is symmetrical about the P–P. All measurement are in millimetres (mm).

4.1 Calculate the total area of the compound section. (4)

4.2 Determine the distance of the centroid of each section from 'M–M'. (3)

4.3 Calculate the sum of the moments of the section about 'M–M'. (5)

4.4 Calculate the position of the centroid of the compound section from 'M–M'. (4)

[16]

QUESTION 5

The system of coplanar, concurrent forces shown in FIGURE 4, DIAGRAM SHEET 2 is held in equilibrium by Force 'Q'.

Use the following scale: Linear scale 1 m = 10 mm and Force scale 1 mm = 1 kN.

5.1 Redraw the space diagram and fully label. (3)

5.2 Calculate the magnitude and direction of force 'Q'. (12)

NOTE: No marks will be allocated for a graphical method.

[15]

QUESTION 6

6.1 Define the term *buoyed*. (2)

6.2 Name TWO absorbent and TWO non-absorbent building materials. (4)

6.3 Explain, with the aid of a neat sketch and labels, a suitable experiment to prove that metals expand in length when they are heated. (8)

[14]

TOTAL: 100

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DIAGRAM SHEET 1

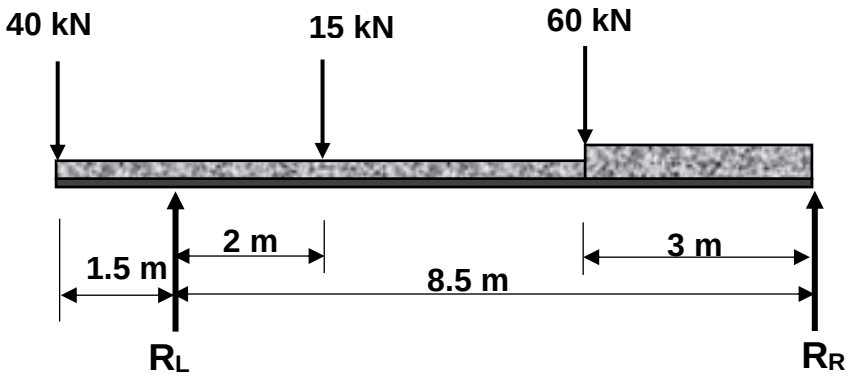


FIGURE 1

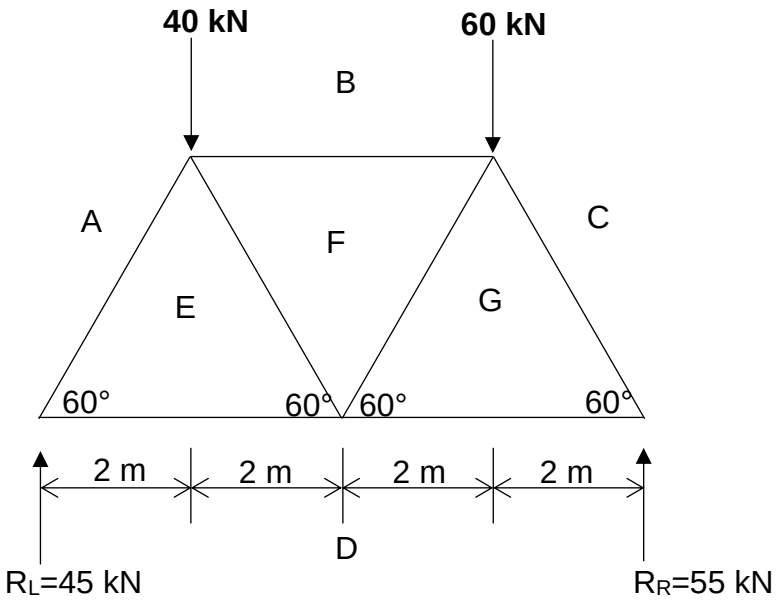


FIGURE 2

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DIAGRAM SHEET 2

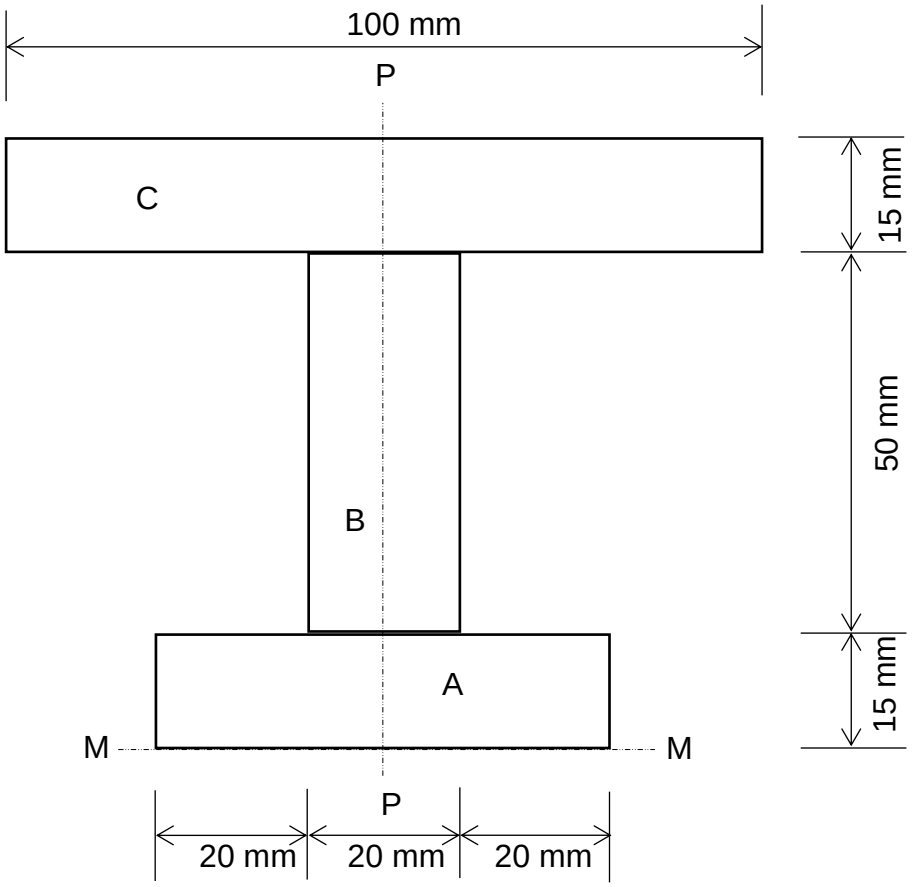


FIGURE 3

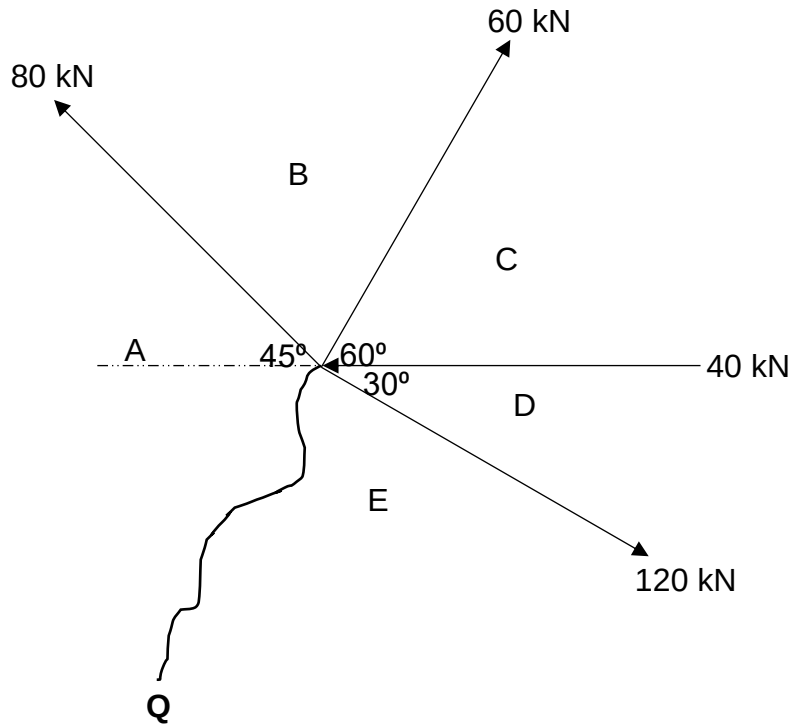


FIGURE 4

BUILDING SCIENCE N2

FORMULA SHEET

Any applicable formula may be used.

1. F =m x g
2. Sinø = O/H Sinø = T/S
3. Cosø = A/H Cosø = A/S
4. Tanø = O/A Tanø = T/A
5. $A = \pi\frac{D^2}{4}$ = π r²
6. A = ½(B x H) A = ½(L x B)
7. $V = \pi\frac{D^2}{4}x\ H$
8. ∑ CM = ∑ ACM
9. ∑ ↑F = ∑ ↓F
10. V = L x B x H
11. M = F x s
12. K = C + 273
13. Moment of area = area x distance from axis
14. VC = W. Sinø VK = W. Sinø
15. HC = W. Cosø HK = W. Cosø
16. $y = \frac{\sum My}{\sum A}$
17. $D = \frac{M}{V}$
18. $RD = \frac{DxS}{DxW}$ = $RD = \frac{MxS}{MxW}$
19. $\Delta L = Lo\ x\ \Delta T\ x\ \alpha$
20. Heat required = $m\ x\ \Delta t\ x\ SHC$
21. $\%\ porosity = \frac{Bulk\ volume - Solid\ volume}{Bulk\ volume}\ x\ 100\%$
22. $saturation\ coefficiant = \frac{volume\ of\ water\ absorbed}{bulk\ volume - solid\ volume}$

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