higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING SCIENCE N2

(15070012)

18 November 2020 (X-paper)
09:00–12:00

This question paper consists of 6 pages and 1 formula sheet.

131Q1E2018

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. Calculators may be used.
6. Round off to THREE decimal places.
7. Assume that 1 kg of mass exerts a force 10 N
8. Write down the formula before you start with the calculations.
9. Write neatly and legibly.

QUESTION 1

1.1 Describe the main purpose of roof covering. (2)

1.2 One needs to take certain factors into consideration when deciding on roof covering.

Name FIVE factors to be considered when deciding on roof covering. (5)

1.3 Define the following terms:

1.3.1 *Flotation*

1.3.2 *Density*

(2 × 2) (4)

1.4 Calculate the relative density of lead if the density of lead is 15 200 kg/m^3 and the density of water 1 000 kg/m^3. (3)

[14]

QUESTION 2

The beam shown in FIGURE 1 below is held at equilibrium by reactions R_L and R_R.

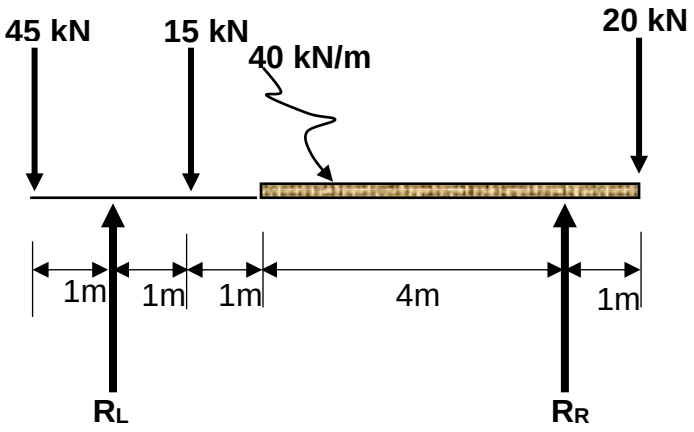

FIGURE 1

2.1 Calculate the magnitude of support at R_L by taking moments about R_R. (5)

2.2 Calculate the magnitude of support at R_R by taking moments about R_L. (5)

2.3 Test your answer by taking the sum of the upward forces and sum of the downward forces into account. (3)

[13]

QUESTION 3

The system of coplanar, concurrent forces shown in FIGURE 2 below is held in equilibrium by force 'P'.

By graphical means determine the magnitude and direction of force 'P'.
NOTE: No marks will be given for any calculations.

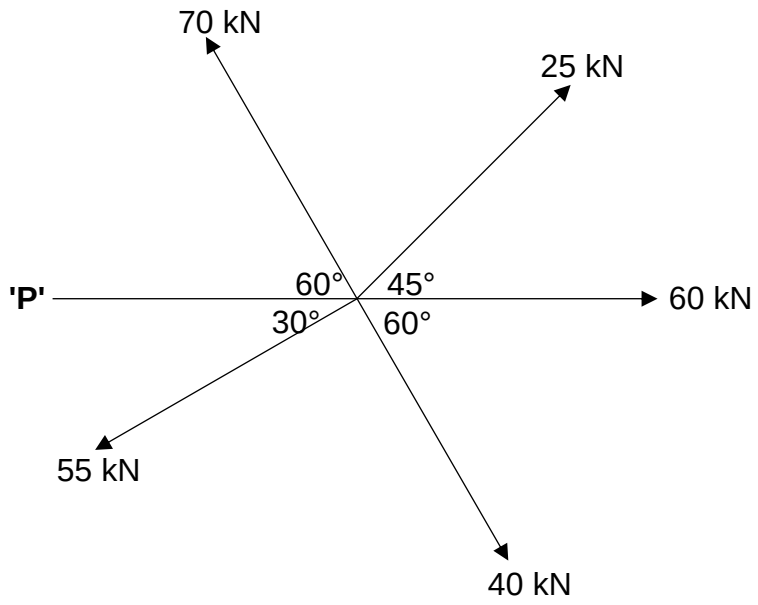

FIGURE 2

[9]

QUESTION 4

4.1 A piece of metal plate of even thickness is shown in FIGURE 3 below. The compound section is symmetrical about A-A. All measurements are in millimetres.

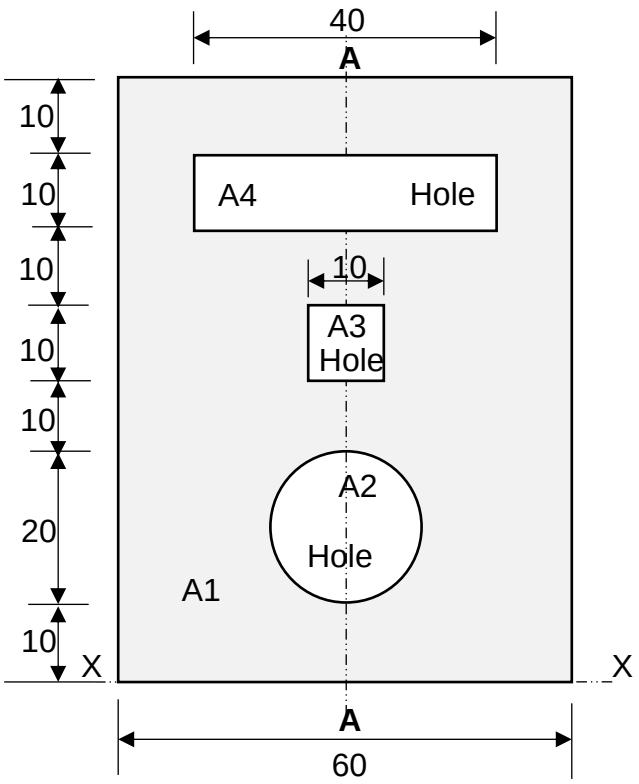

FIGURE 3

4.1.1 Calculate the total area of the compound section. (5)

4.1.2 Determine the distance of the centroid of each section from 'X-X'. (4)

4.1.3 Calculate the sum of the moments of the section about 'X-X'. (6)

4.1.4 Calculate the position of the centroid of the compound section from 'X-X'. (4)

4.2 State the different between *couple* and *centroid*. (4)

[23]

QUESTION 5

5.1 FIGURE 4 below shows a simple supported roof truss with two supports R_L and R_R

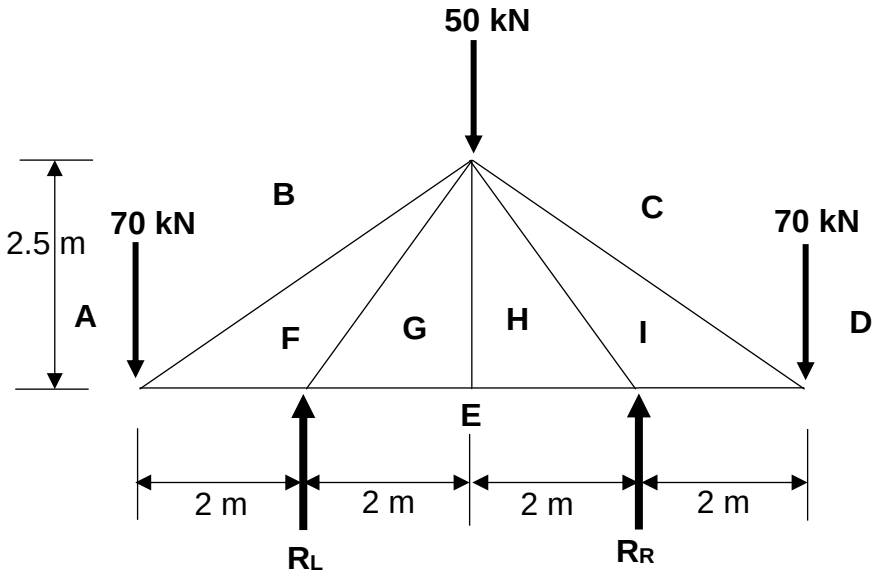

FIGURE 4

Use the following scales: Linear scale 1 m = 10 mm and Force scale 1 mm = 1 kN to do the following:

5.1.1 Redraw the space diagram. (4)

5.1.2 Complete the vector diagram required to analyse the forces in the members. (13)

5.1.3 Determine the magnitude and nature of the forces in each member of the frame and tabulate the findings neatly. (9)

[26]

QUESTION 6

6.1 Propagation means the circulation or the transfer of heat.

Name THREE ways in which heat can be transferred. (3)

6.2 Explain a suitable experiment to prove that different materials do not expand equally. (9)

6.3 A round bar of 1.35 m in length is cut between the centres of length causing a rise in temperature of 35 °C. The coefficient of linear expansion is 12×10^{-6}/°C.

Calculate the change in length of the round bar. (3)

[15]

TOTAL: 100

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