higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING SCIENCE N1

(15070001)

19 November 2019 (X-Paper)
09:00–12:00

Calculators may be used.

This question paper consists of 4 pages, 1 addendum and 1 formula sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
BUILDING SCIENCE N1
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. Sketches must be large, neat and fully labelled.
5. Assume that 1 kg mass exerts a force of 10 N.
6. Write the formula before starting with a calculation.
7. Round off numerical answers to TWO decimals.
8. Write neatly and legibly.

QUESTION 1

Show, with the aid of sketches, how each of the following is represented:

1.1 Acute angle

1.2 Perpendicular lines

1.3 Obtuse angle

1.4 Parallelogram

1.5 Isosceles triangle

(5 × 3) **[15]**

QUESTION 2

2.1 Briefly explain the term *density of a substance*. (3)

2.2 A concrete block is 200 mm × 125 mm × 50 mm and has a mass of 22,50 kg.

Calculate the density of the concrete block in g/m^3. (6)

2.3 Explain, with the aid of a neat sketch, the displacement method in determining the volume of a small irregular solid of nonporous material. (6)

[15]

QUESTION 3

3.1 Name and briefly explain each process timber goes through after it has been felled. (3 × 2) (6)

3.2 Draw a neat cross section of a tree trunk and label the different parts. (10)

[16]

QUESTION 4

4.1 Sketch and explain a simple experiment to show that fluid pressure is the same in ALL directions. (6)

4.2 Calculate the water pressure in kilopascal at the bottom of a tank that has a diameter of 750 mm and is filled with water to a height of 1,5 m. (8)

[14]

QUESTION 5

5.1 Use a suitable scale to determine graphically the magnitude, direction and sense of the resultant of the THREE coplanar forces shown in FIGURE 1 on the ADDENDUM (attached). (8)

5.2 Determine graphically the horizontal and vertical components of a 55 N force acting at an angle of 45° to the horizontal by using a scale of 1 cm = 5 N. (8)
[16]

QUESTION 6

6.1 Define the term *polygon of forces*. (4)

6.2 Determine graphically the equilibrant force of the system of concurrent coplanar forces in FIGURE 2 on the ADDENDUM (attached). Use a scale of 1 cm = 50 N. (8)
[12]

QUESTION 7

Determine, with the link-polygon method, the position and magnitude of the resultant of the THREE forces acting on the beam shown in FIGURE 3 on the ADDENDUM (attached). Use 1 cm = 1 m for the space diagram and 1 cm = 10 N for the polar diagram. Clearly show the direction of the resultant and the distance from the left-hand end of the beam. **[12]**

TOTAL: 100

ADDENDUM

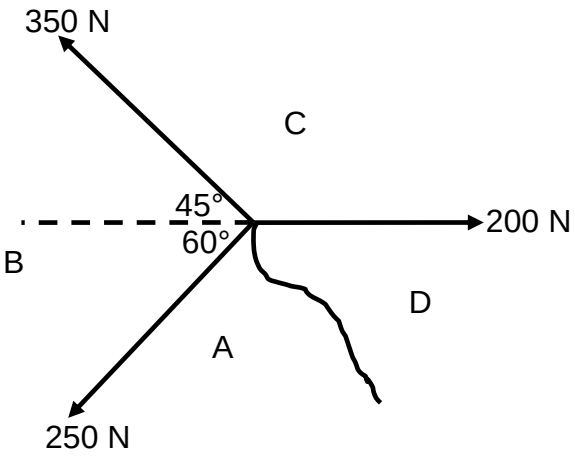

FIGURE 1

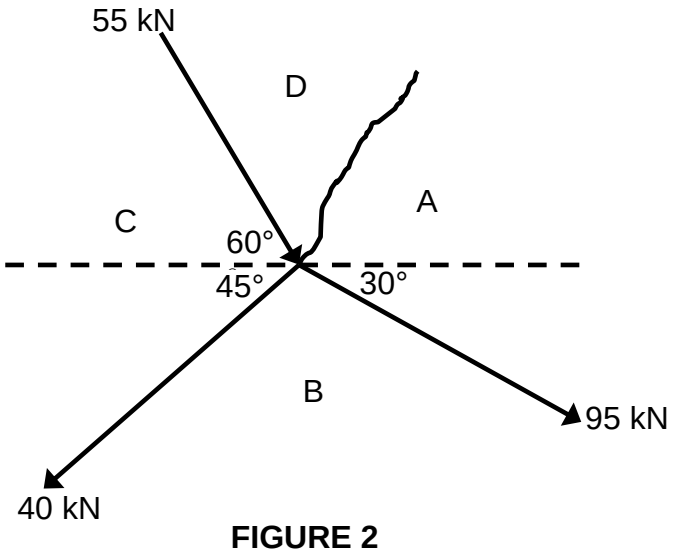

FIGURE 2

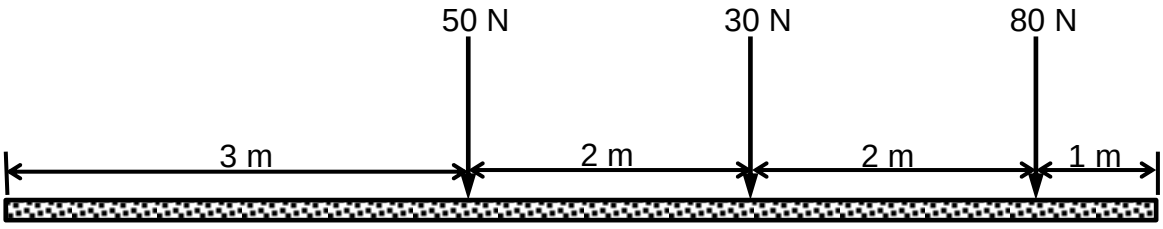

FIGURE 3

FORMULA SHEET

Any applicable formula may also be used.

1. $F = m \times g$
2. $\sin\theta = \frac{O}{H}$
3. $\cos\theta = \frac{A}{H}$
4. $\tan\theta = \frac{O}{A}$
5. $A = \frac{\pi D^2}{4} = \pi r^2$
6. $A = ½ (B \times h)$
7. $V = \frac{\pi D^2}{4} \times h$
8. $V = \frac{4}{3}\pi r^3$
9. $V = \frac{1}{3}\pi r^2 h$
10. $D = \frac{M}{V}$
11. $R.D. = \frac{M.S}{M.W}$
12. $K = C + 273$
13. $VC = F.\sin 2$
14. $HC = F.\cos 2$
15. $V = L \times B \times H$
16. $\%MC = \frac{IW - DW}{DW} \times 100$
17. $P = h \times d \times g$
18. Water-cement ratio:

    $W.C.R. = \frac{M.W.}{M.C.}$
19. $R^2 = VC^2 + HC^2$
20. $W = P \times V \times g$
21. $W = m \times g$
22. $P_1V_1 = P_2V_2$