



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T230(E)(J26)T

NATIONAL CERTIFICATE BUILDING SCIENCE N1

(15070001)

**26 July 2018 (X-Paper)
09:00–12:00**

Nonprogrammable calculators and drawing instruments may be used.

This question paper consists of 5 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. Rule off on completion of each answer.
 5. ALL sketches and/or diagrams must be done in pencil, neat, reasonably large and fully labelled.
 6. Untidy and/or illegible work will be penalised.
 7. Assume that 1 kg mass exerts a force of 10 N.
 8. Round off numerical answers to TWO decimal places.
 9. Write the formula before starting with a calculation.
 10. Write neatly and legibly.
-

QUESTION 1

- 1.1 Calculate:
- 1.1.1 The area of a circle with a radius of 25 cm (3)
- 1.1.2 The volume of a cylinder with a base diameter of 30 cm and height of 95 cm (3)
- 1.2 Give the SI unit, together with the symbol, in which each of the following is measured:
- 1.2.1 Density
- 1.2.2 Pressure
- 1.2.3 Moment of force
- 1.2.4 Thermodynamic temperature (4 × 1) (4)
- [10]**

QUESTION 2

- 2.1 Define the term *density of a material*. (3)
- 2.2 Give THREE examples of materials suitable for damp-proof courses. (3)
- 2.3 A timber beam 4,2 m long, 52 mm wide and 215 mm deep has a mass of 51,6 kg.
- Calculate the density of the timber in kg/m³. (6)
- 2.4 Describe with the aid of a neat sketch the displacement method to find the volume of a small irregular solid of nonporous material. (6)
- [18]**

QUESTION 3

- 3.1 Give THREE ingredients used in concrete. (3)
- 3.2 Define the term *bulking of sand*. (3)
- 3.3 Calculate the water-cement ratio of a concrete mixture which contains 45 kg cement and 50 litres of water. (4)
- [10]**

QUESTION 4

- 4.1 Define *Charles's law*. (3)
- 4.2 Convert 295 K to °C . (2)
- 4.3 The volume of a gas is 7 m³ at a pressure of 280 kPa.
Calculate the volume of the gas if the pressure is increased to 650 kPa while the temperature remains constant. (6)
- 4.4 Draw a neat, labelled cross-section of a water closet with a U-shape bend in the pipe and clearly show the water seal on the sketch. (5)
[16]

QUESTION 5

- 5.1 Explain each of the following timber terms:
- 5.1.1 Seasoning
 - 5.1.2 Conversion
 - 5.1.3 Preservation
- (3 × 2) (6)
- 5.2 Name FOUR types of effective water-soluble preservatives. (4)
- 5.3 A piece of timber has a mass of 985 g. After oven-drying to a constant mass it weighs 814 g.
Calculate the percentage moisture content of the timber. (4)
[14]

QUESTION 6

- 6.1 Define the term *coplanar forces*. (3)
- 6.2 The three concurrent coplanar forces shown in FIGURE 1 on the ADDENDUM (attached) are in equilibrium.
Determine graphically the magnitude and direction of forces P and Q. Clearly show the direction in the space diagram. (7)
[10]

QUESTION 7

FIGURE 2 on the ADDENDUM (attached) shows four forces acting on a pin.

Determine graphically the magnitude and direction of the equilibrant and also the magnitude of the horizontal and vertical components of the equilibrant.

[12]**QUESTION 8**

Determine the magnitude of the reactions R_L and R_R for the simply supported beam shown in FIGURE 3 on the ADDENDUM (attached) by using the link-polygon method. Ignore the mass of the beam.

[10]**TOTAL: 100**

ADDENDUM

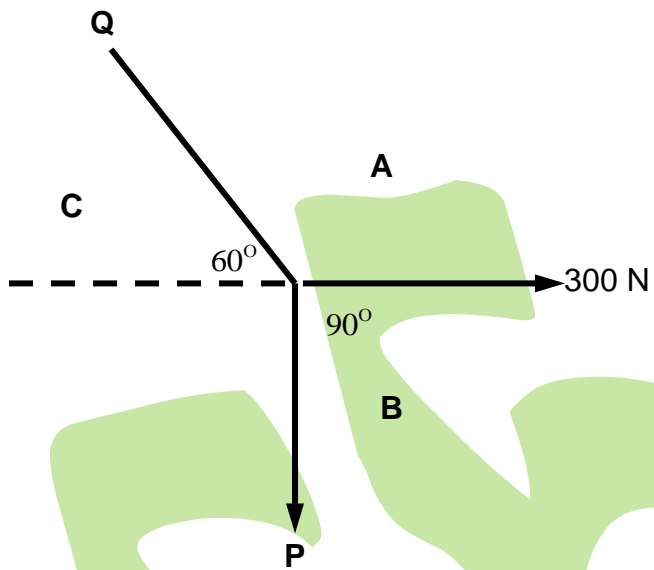


FIGURE 1

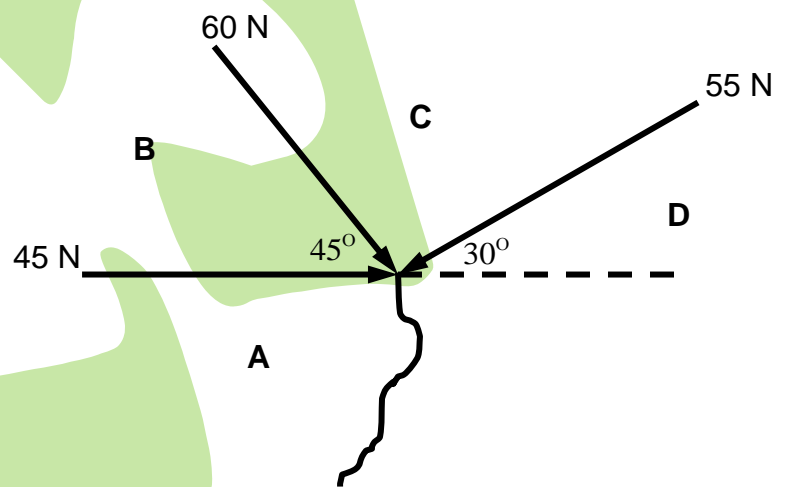


FIGURE 2

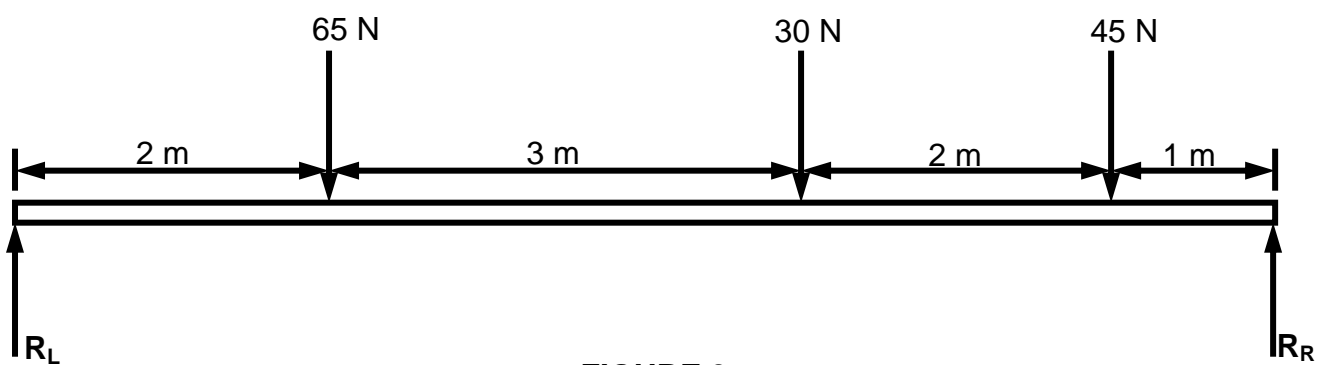


FIGURE 3

FORMULA SHEET

Any applicable formula may also be used.

$$1. F = m \times g$$

$$2. \sin \theta = \frac{O}{H}$$

$$3. \cos \theta = \frac{A}{H}$$

$$4. \tan \theta = \frac{O}{A}$$

$$5. A = \frac{\pi D^2}{4} = \pi r^2$$

$$6. A = \frac{1}{2} (B \times h)$$

$$7. V = \frac{\pi D^2}{4} \times h$$

$$8. V = \frac{4}{3} \pi r^3$$

$$9. V = \frac{1}{3} \pi r^2 h$$

$$10. D = \frac{M}{V}$$

$$11. R.D. = \frac{M.S}{M.W}$$

$$= \frac{D.S}{D.W}$$

$$12. K = C + 273$$

$$13. P_1 V_1 = P_2 V_2$$

$$14. VC = F \cdot \sin^2$$

$$15. HC = F \cdot \cos^2$$

$$16. V = L \times B \times H$$

$$17. \% MC = \frac{IW - DW}{DW} \times 100$$

$$18. P = h \times d \times g$$

$$19. \text{Water-cement ratio:}$$

$$W.C.R. = \frac{M.W.}{M.C.}$$

$$20. R^2 = VC^2 + HC^2$$

$$21. W = P \times V \times g$$

$$22. W = m \times g$$