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higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING SCIENCE N1

(15070001)

2 April 2020 (X-paper)
09:00–12:00

Candidates may use drawing instruments and calculators.

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

060Q1A2002

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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. All sketches and diagrams must be done in pencil and must be neat, reasonably large and fully labelled.
5. Write down the formula before starting with a calculation.
6. Assume that 1kg mass exerts a force of 10 N.
7. Round off answers to two decimals where necessary.
8. Rule off on completion of each answer.
9. Work neatly.

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QUESTION 1

Calculate the following:

1.1 Volume of cylinder with base diameter of 45 mm and height of 120 mm (3)

1.2 Area of circle with radius of 80 mm (3)

1.3 Give the name of the SI unit in which each of the following is measured:

1.3.1 Speed

1.3.2 Weight

1.3.3 Temperature

1.3.4 Pressure

(4 × 1) (4)
[10]

QUESTION 2

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1–2.5) in the ANSWER BOOK.

2.1 Porosity of a material means the mass is not solid throughout, but contains a certain amount of air space.

2.2 Gravity is the force of attraction the earth exerts on other bodies.

2.3 The resultant of two or more forces is that single force which brings these forces to rest or which balances the two or more forces.

2.4 The process of sawing logs into planks and boards is known as seasoning.

2.5 A number of forces acting on a body are called co-planar forces.

(5 × 2) **[10]**

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QUESTION 3

3.1 State Charles's law. (3)

3.2 Convert 50 °C to Kelvin. (2)

3.3 The volume of a gas is 12 m^3 at a pressure of 420 kPa.

Calculate the volume of the gas if the pressure is increased to 950 kPa while the temperature remains constant. (6)

3.4 Draw a neat, labelled cross-section of a water closet with a U-shaped bend in the pipe, clearly showing the water seal. (5)

[16]

QUESTION 4

4.1 Define *relative density.* (3)

4.2 Calculate the density of paint using the information below.

- Mass of empty container = 55 g
- Mass of empty container and paint = 98 g
- Volume of paint = 75 cm^3 (5)

4.3 Determine the mass of a timber block 4,5 m long, 0,5 m wide and 0,3 m thick. The relative density of timber is 0,80. (6)

[14]

QUESTION 5

5.1 Give TWO main classes of timber. (2)

5.2 What is the main purpose of preserving timber? (2)

5.3 Name SIX wood-boring insects found in South Africa. (6)

5.4 A damp wooden block has a mass of 450 g. The block is then put in an oven to dry whereafter it weighs 350 g.

Calculate the percentage moisture content of the timber. (5)

[15]

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QUESTION 6

6.1 What is the meaning of *coplanar forces*? (3)

6.2 Determine the magnitude of the forces S and T shown in FIGURE 1 below by means of the polygon of forces. (8)

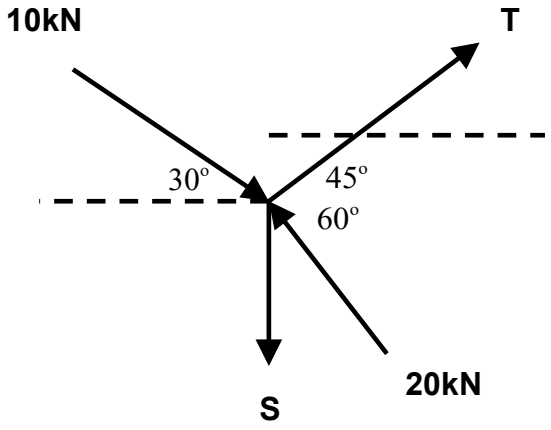

FIGURE 1

6.3 Calculate the magnitude of the horizontal and vertical components of the force **T**. (4)

[15]

QUESTION 7

FIGURE 2 below shows THREE forces acting on a pin.

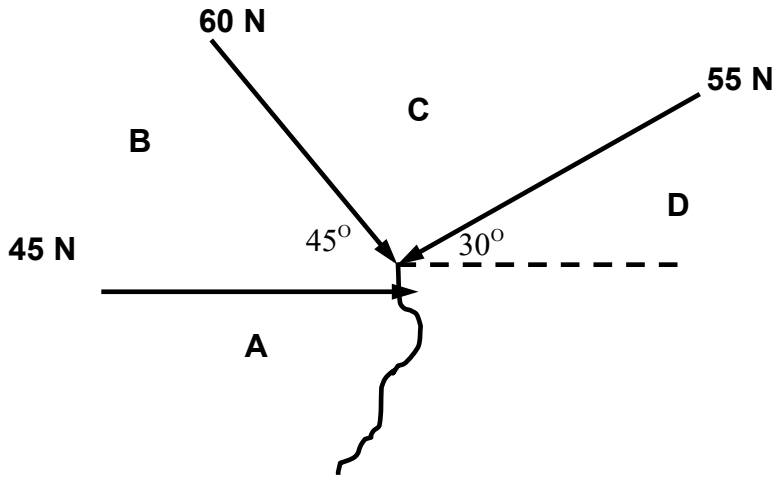

FIGURE 2

Graphically determine the magnitude and direction of the equilibrant. **[10]**

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QUESTION 8

Determine the position and magnitude of the resultant of the THREE forces acting on the beam A–B in FIGURE 3 below by using the link polygon method. **[10]**

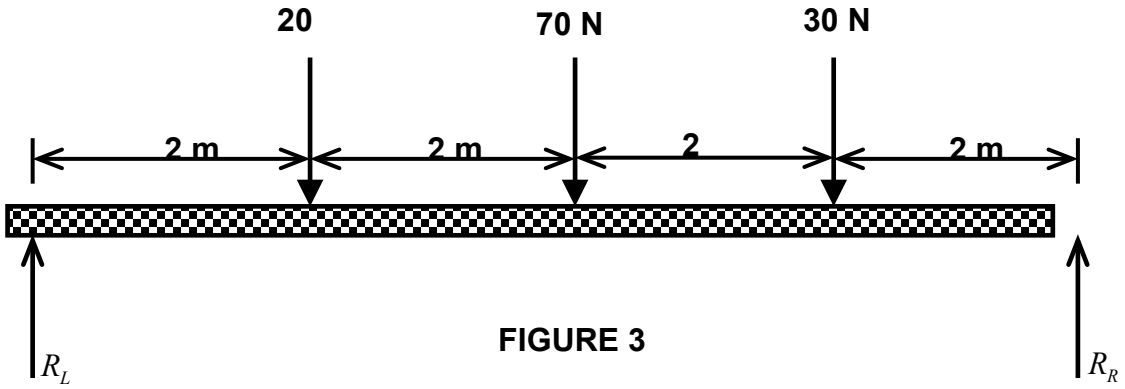

FIGURE 3

TOTAL: 100

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BUILDING SCIENCE N1

FORMULA SHEET

Any applicable formula may also be used.

1. $F = m \times g$

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

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

   $\cos \theta = \frac{A}{S}$

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

   $\tan \theta = \frac{T}{A}$

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

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

12. $K = C + 273$

13. $VC/VK = F \cos \theta$

14. $HC/HK = F \cos \theta$

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

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

    $\%VI = \frac{AG - DG}{DG} \times 100$

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

18. Water/cement ratio/
    Water/sementverhouding

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

    $W.S.V = \frac{M.W}{M.S}$

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

    $R^2 = VK^2 + HK^2$

20. $W = P \times V \times g$
    $G = P \times V \times g$

21. $W = m \times g$

22. $P_1V_1 = P_2V_2$

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