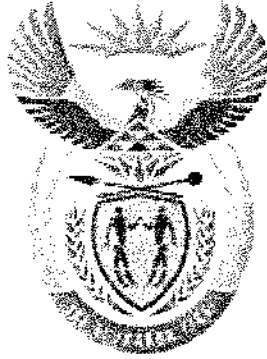


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higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

**T210(E)(A7)T
NATIONAL CERTIFICATE**

APRIL EXAMINATION

BUILDING SCIENCE N2

(15070012)

**7 April 2015 (Y-Paper)
13:00–16:00**

This question paper consists of 5 pages, 2 diagram sheets and 1 formula sheet.

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. Write neatly and legibly.
-

QUESTION 1

1.1 Convert the following values:

1.1.1 30 °C to kelvin

1.1.2 293 kelvin to °C

(2 x 2) (4)

1.2 Make a neat sketch of the Celsius thermometer and Kelvin scale thermometer and clearly show the freezing and boiling points on each. (6)

1.3 What is the abbreviation used for *specific heat capacity*? (1)

1.4 Calculate the mass of steel required if 267,3 kJ heat energy is needed to raise the temperature of the steel from 283 K to 338 K.

The specific heat capacity of steel is 0,486 kJ/kg.K.

Let t_2 be the final temperature in kelvin and t_1 the initial temperature in kelvin. (4)
[15]

QUESTION 2

2.1 What is meant by *capillarity*? Explain by referring to voids in a burnt clay brick. (4)

2.2 Explain how the porosity of a material will influence its strength. (6)

2.3 Calculate the volume of the pores of a material for which the following information is given:

Saturation coefficient = 0,90

Volume of water absorbed = 0,036 cm³

(4)
[14]

QUESTION 3

3.1 What can be deduced from Archimedes' discovery if a body that contains matter is immersed partially or wholly in a fluid? Keep in mind the properties of matter. (6)

3.2 Define the term *buoyed*. (2)

3.3 Describe the experiment used to prove that the volume of a body immersed in water is equal to the volume of the displaced water. (7)
[15]

QUESTION 4

- 4.1 Name any FIVE properties of lead as roof covering. (5)
- 4.2 What happens to copper if it is subjected to climatic change? (1)
[6]

QUESTION 5

- 5.1 What does the *triangle of forces* state? (4)
- 5.2 The system of coplanar, concurrent forces shown in FIGURE 1, on the attached DIAGRAM SHEET 1 is held in equilibrium by the force **F**.
Calculate the magnitude and direction of force **F** by adding the components of the given forces. (12)
[16]

QUESTION 6

The beam shown in FIGURE 2 on the attached DIAGRAM SHEET 1 is in equilibrium. It supports four point loads and one uniformly distributed load as indicated.

Ignore the weight of the beam and calculate the following:

- 6.1 6.1.1 The magnitude of the reaction at A by taking moments about the reaction at B (4)
- 6.1.2 The magnitude of the reaction at B by taking moments about the reaction at A (4)
- 6.2 Test the TWO answers in QUESTION 6.1. (2)
[10]

QUESTION 7

A metal piece of uniform thickness is shown in FIGURE 3 on the attached DIAGRAM SHEET 2. This workpiece has a round hole exactly in the centre of the top part.

Calculate the position of the centre of gravity by taking moments about X–X. Tabulate the solution neatly.

[9]

QUESTION 8

FIGURE 4 on the attached DIAGRAM SHEET 2 depicts a roof truss that is loaded and supported symmetrically.

- 8.1 Redraw the given SPACE DIAGRAM to a scale of 1 : 100 in the ANSWER BOOK and show the nature of the forces. (1)
- 8.2 Determine the magnitude and nature of the force in each member of the roof truss by drawing a VECTOR DIAGRAM to scale 2 mm = 1 kN. (7)
- 8.3 Redraw and complete the TABLE below in the ANSWER BOOK.

MEMBER	MAGNITUDE	TIE	STRUT
BH; EN			
CK; DL			
FN; AH			
GM; GJ			
HJ; MN			
JK; LM			
KJ			

(7)
[15]

TOTAL: 100

DIAGRAM SHEET 1

QUESTION 5.2

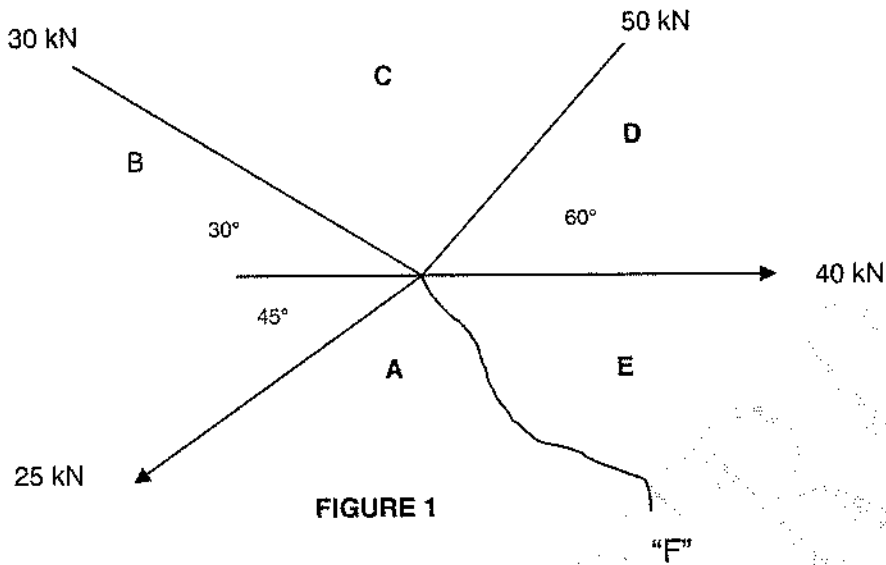


FIGURE 1

QUESTION 6

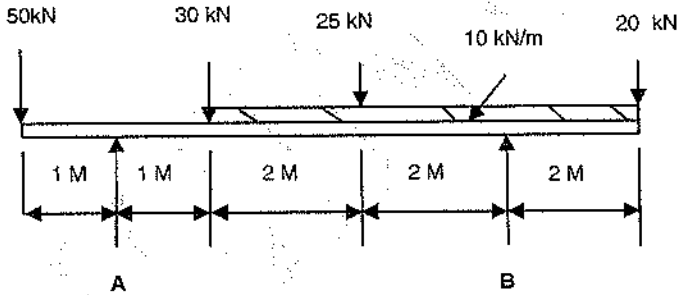


FIGURE 2

DRAWINGS NOT TO SCALE

DIAGRAM SHEET 2

QUESTION 7

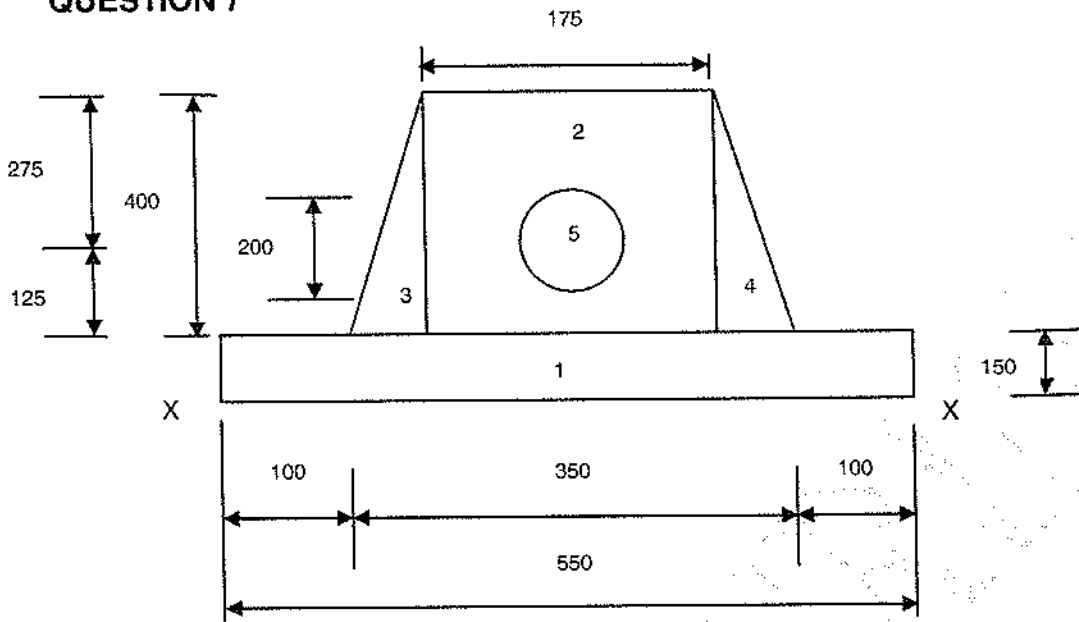


FIGURE 3

QUESTION 8

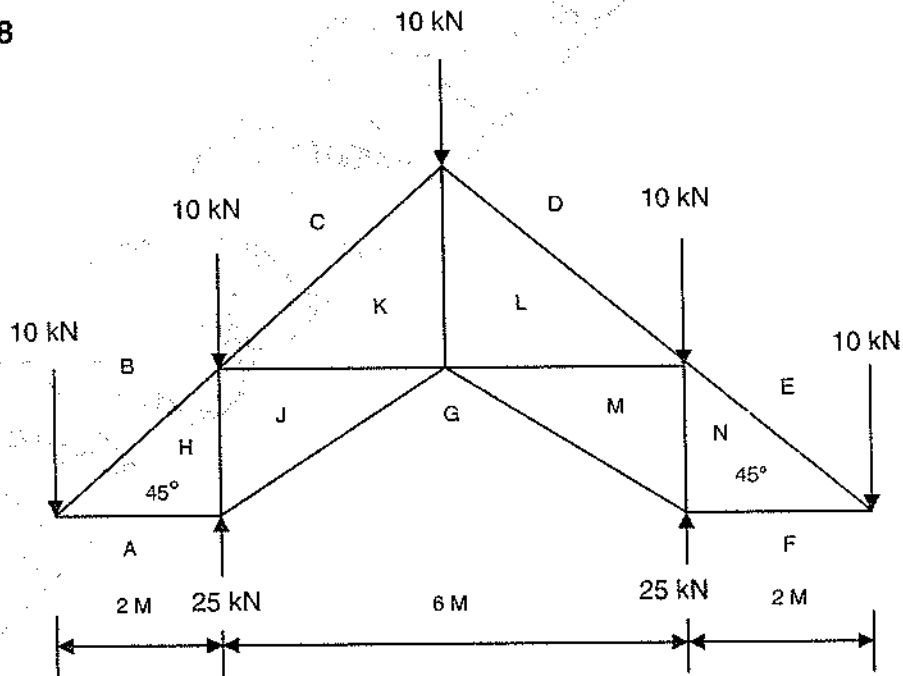


FIGURE 4

DRAWINGS NOT TO SCALE

BUILDING SCIENCE N2**FORMULA SHEET**

Any other applicable formula may also be used.

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

$$2. \quad VC = R \sin 2 \\ HC = R \cos 2$$

$$3. \quad R = \sqrt{VC^2 + HC^2}$$

$$4. \quad M = F \times s$$

$$5. \quad \Gamma_{CWM} = \Gamma_{ACWM}$$

$$6. \quad \Gamma_{F} = \Gamma_{:F}$$

$$7. \quad x = \frac{\Sigma Ax}{\Sigma A}$$

$$8. \quad T = \frac{g \cdot \rho \cdot h \cdot r}{2}$$

$$9. \quad \tau = r \cdot F \cdot \sin 2$$

$$10. \quad \% \text{ Porosity} = \frac{\text{Bulk Volume} - \text{Solid Volume}}{\text{Bulk Volume}} \times 100$$

$$11. \quad \text{Saturation coefficient} = \frac{\text{Volume of water absorbed}}{\text{Bulk Volume} - \text{Solid Volume}}$$

$$12. \quad D = \frac{m}{V}$$

$$13. \quad RD = \frac{DS}{D.W} = \frac{mS}{mW}$$

$$14. \quad 0^{\circ}\text{C} = 273 \text{ K}$$

$$15. \quad Lu = Lo \times \mu \times \nabla$$

$$16. \quad \text{Heat Required} = Lo \times \mu \times SHC$$

$$17. \quad \text{Heat Gain} = \text{Heat Loss}$$