higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T170**(E)**(N24)T

NOVEMBER EXAMINATION

NATIONAL CERTIFICATE

BUILDING SCIENCE N1

(15070001)

24 November 2016 (X-Paper)
09:00–12:00

Calculators and drawing instruments may be used.

This question paper consists of 5 pages 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. Assume that 1 kg mass exerts a force of 10 N.
7. Numerical answers are to be rounded off to two decimal places after the decimal comma.
8. Write the formula before starting with a calculation.
9. Write neatly and legibly.

QUESTION 1

1.1 Concrete is an important construction material.

Briefly outline SEVEN factors that influence the quality of concrete. (7)

1.2 Define the following

1.2.1 Water-cement ratio (3)

1.2.2 Coarse aggregates (2)

1.2.3 Fine aggregates (2)

1.3 Calculate the mass of cement required if the water-cement ration is 0,5 and the mass of water is 200 kg. (4)

[18]

QUESTION 2

2.1 FIGURE 1 below shows a simply supported beam.

Determine graphically by using the link polygon method the reaction RL and RR.

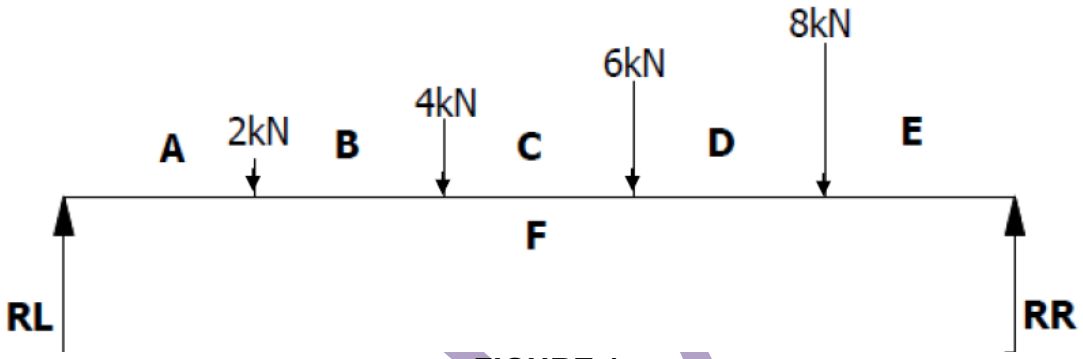

FIGURE 1 (13)

2.2 Determine the horizontal distance between the resultant force and RL. (2)

[15]

QUESTION 3

3.1 Explain why damp proofing is important. (5 x 2) (10)

3.2 List FIVE materials that are used for damp proofing. (5)

3.3 What is a *slump test*? (2)

3.4 What are the minimum and maximum values of slump for a concrete mix used for foundations? (2 x 2) (4)

3.5 What are the principal requirements of a timber drying shed? (3)
[24]

QUESTION 4

4.1 Make a neat, fully labelled sketch of a lift-and-force pump. (10)

4.2 Define the following:

4.2.1 Boyle's law

4.2.2 Charles' law

(2 × 1) (2)

4.3 The relative density of a material is 4,65. The following dimensions are given:

Length – 1 m
Width – 0,8 m
Height – 0,35 m

Calculate the following:

4.3.1 The density of the material

4.3.2 The mass of the object

(2 × 2) (4)

4.4 State FOUR measurable properties of gasses. (4)
[20]

QUESTION 5

5.1 Define the term *equilibrant* as applied to a system of forces. (1)

5.2 FIGURE 2 below shows a system of coplanar forces.

Determine graphically the magnitude and direction of the resultant and equilibrant of the system of forces shown.

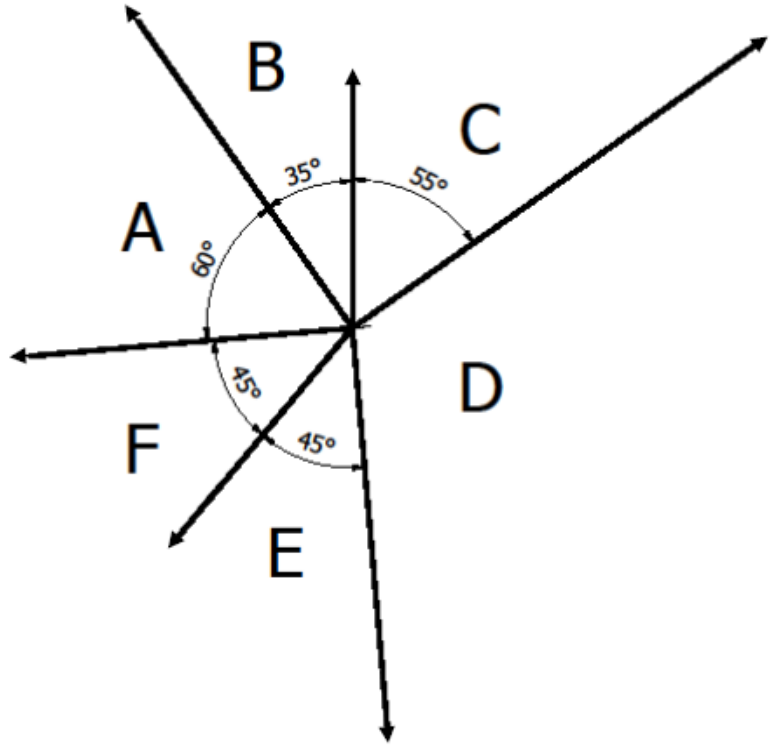

FIGURE 2

(9)
[10]

QUESTION 6

6.1 Calculate the porosity of a clay brick which is 220 mm in length, 110 mm in width and 75 mm in height. The brick weighs 2,5 kg and its solid volume is 1 350 cm^3. (6)

6.2 Determine the solid density of the brick described in QUESTION 6.1. (2)

6.3 Briefly describe how to carry out an experiment to determine the density of water. (5)
[13]

TOTAL: 100

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. $P_1V_1 = P_2V_2$