higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T300**(E)**(N17)T
NOVEMBER 2010

NATIONAL CERTIFICATE

BUILDING SCIENCE N3

(15070023)

17 November (X-Paper)
09:00 – 12:00

Calculators and drawing instruments may be used.

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

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
BUILDING SCIENCE N3
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers correctly according to the numbering system used in this question paper.
4. ALL diagrams, sketches and labelling must be done in pencil.
5. 1 kg = 10 N.
6. Write neatly and legibly.

QUESTION 1

1.1 Name and describe TWO types of electricity. (4)

1.2 Explain the following electrical terms:

1.2.1 Conductors (2)
1.2.2 Insulators (2)
1.2.3 Potential difference (2)
[10]

QUESTION 2

A simply supported beam is shown in FIGURE 1, DIAGRAM SHEET 1 (attached).

2.1 Calculate the reactions at the supports RL and RR. (5,5)

2.2 Calculate the bending moments at points A, B, C and D. (3,5)

2.3 Draw the shear force diagram to scale 1 mm = 1 kN. (3,5)

2.4 Draw the bending moment diagram to scale 1 mm = 1 kNm. (2,5)
[15]

QUESTION 3

A lamina is shown in FIGURE 2, DIAGRAM SHEET 1 (attached).

Calculate the following:

3.1 3.1.1 The area of SECTIONS 1 and 5 (1)

3.1.2 The area of SECTIONS 2 and 4 (1)

3.1.3 The area of SECTION 3 (1)

3.2 The total area of the figure (1)

3.3 3.3.1 The distance from side AB to the centre of SECTION 1 (1)

3.3.2 The distance from side AB to the centre of SECTION 2 (1)

3.3.3 The distance from side AB to the centre of SECTION 3 (1)

3.3.4 The distance from side AB to the centre of SECTION 4 (1)

3.3.5 The distance from side AB to the centre of SECTION 5 (1)

3.4 3.4.1 The distance from side AC to the centre of SECTIONS 1 and 5 (1)

3.4.2 The distance from side AC to the centre of SECTIONS 2 and 4 (1)

3.4.3 The distance from side AC to the centre of SECTION 3 (1)

3.5 The distance of the centre of gravity of the figure from side AB (1,5)

3.6 The distance of the centre of gravity of the figure from side AC (1,5)
[15]

QUESTION 4

A loaded beam is shown in FIGURE 3, DIAGRAM SHEET 2 (attached). The reaction RR is vertical and the reaction RH is at an angle.

Calculate the following:

4.1 The reaction at RR (4)

4.2 The sum of the vertical components (4)

4.3 The sum of the horizontal components (2)

4.4 The reaction at RH (3)

4.5 The angle and the direction of the reaction at RH (2)
[15]

QUESTION 5

FIGURE 4, DIAGRAM SHEET 2 (attached) shows a frame that is in equilibrium.

5.1 Calculate the reactions at the supports. (2,5)

5.2 Draw the force diagram to scale 1 mm = 1 kN. (5,5)

5.3 Copy and complete the following table in the ANSWER BOOK.

MEMBER	MAGNITUDE	NATURE
AE		
BF		
CG		
DG		
DE		
EF		
FG		

(7)
[15]

QUESTION 6

6.1 Name TWO types of friction. (2)

6.2 State FOUR laws of kinetic friction. (8)
[10]

QUESTION 7

In a certain machine, an effort of 40 N was required to raise a body having a mass of 50 kg. When the body was raised 30 mm, the effort moved through a distance of 0,54 m.

Calculate the following:

7.1 The weight being lifted (2)

7.2 The velocity ratio (3)

7.3 The mechanical advantage (2)

7.4 The efficiency of the machine (3)
[10]

QUESTION 8

8.1 Describe the following terms regarding matter:

8.1.1 Molecule (2)

8.1.2 Atom (2)

8.1.3 Element (2)

8.1.4 Compound (2)

8.2 Explain the difference between a mixture and a compound. (2)
[10]

TOTAL: 100

BUILDING SCIENCE N3

FORMULA SHEET

Any applicable formula may also be used.

1. $F = m \times g$
2. $A = \frac{\pi D^2}{4}$
3. $F\mu = \mu \times W$
4. $\mu = \tan \phi$
5. Comp. $// = W \sin \phi$
   Komp. $// = W \sin \phi$
6. Comp. $\perp = W \cos \phi$
   Komp. $\perp = W \cos \phi$
7. $F1 = \mu W \cos \phi + W \sin \phi$
8. $F\mu = \mu W \cos \phi$
9. $F2 = \mu W \cos \phi - W \sin \phi$
10. $s = ut + \frac{1}{2}at^2$
11. $v = u \pm 2as$
12. $v = u^2 \pm at$
13. $M = m\_ \times v$
14. $m \times u = m \times v$
15. $VR = \frac{Effort\ distance}{Load\ distance}$
    $SV = \frac{Magafstand}{Lasafstand}$
16. $MA = \frac{Load}{Effort}$
    $HV = \frac{Las}{Mag}$
17. $n = \frac{HV}{SV} \times 100$
18. $V = I \times R$
19. $R_T = R_1 + R_2 + R_3$
20. $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$
21. $P = V \times I$
22. $W = P \times t$
23. $AV = F \times S$
    $WD = F \times S$
24. $MOM = F \times \perp S$
25. $A = L \times B$
26. $A = \pi r^2$
27. $A = \frac{1}{2}\ bh\ /\ \frac{1}{2}ab \sin C$
28. $A = 4\pi r^2$
29. $\bar{x} = \frac{4r}{3}$
30. $\bar{x} = \frac{1}{3}h$
31. $R = \sqrt{HK^2 + VK^2}$
    $R = \sqrt{HC^2 + VC^2}$
32. $\text{TAN}\,\phi = \frac{VC}{HC} / \frac{VK}{HK}$
33. Mass of water in mixture = water:cement ratio × mass of cement

    Massa van water in mengsel = water:sementverhouding × massa sement
34. Work done by effort in raising the load = effort × velocity ratio (VR)× load distance

    Werk wat deur mag gedoen is om die las te lig = mag × snelheidsverhouding × las-afstand

DIAGRAM SHEET 1

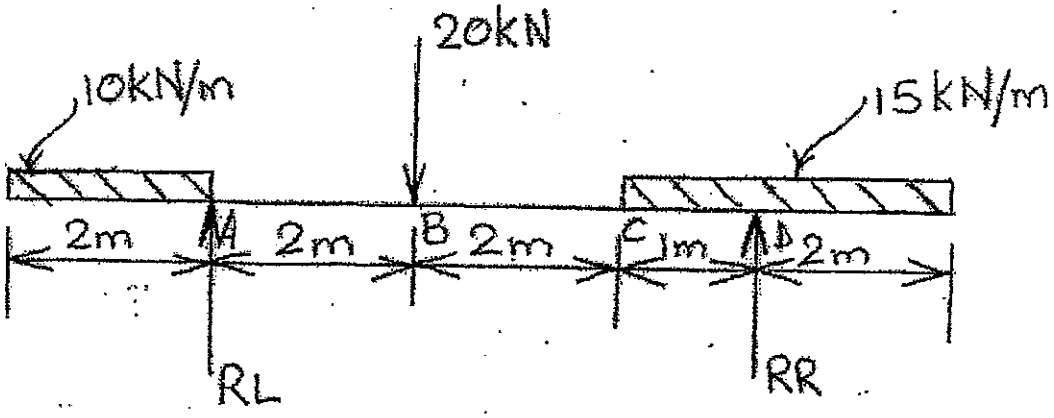

FIGURE 1

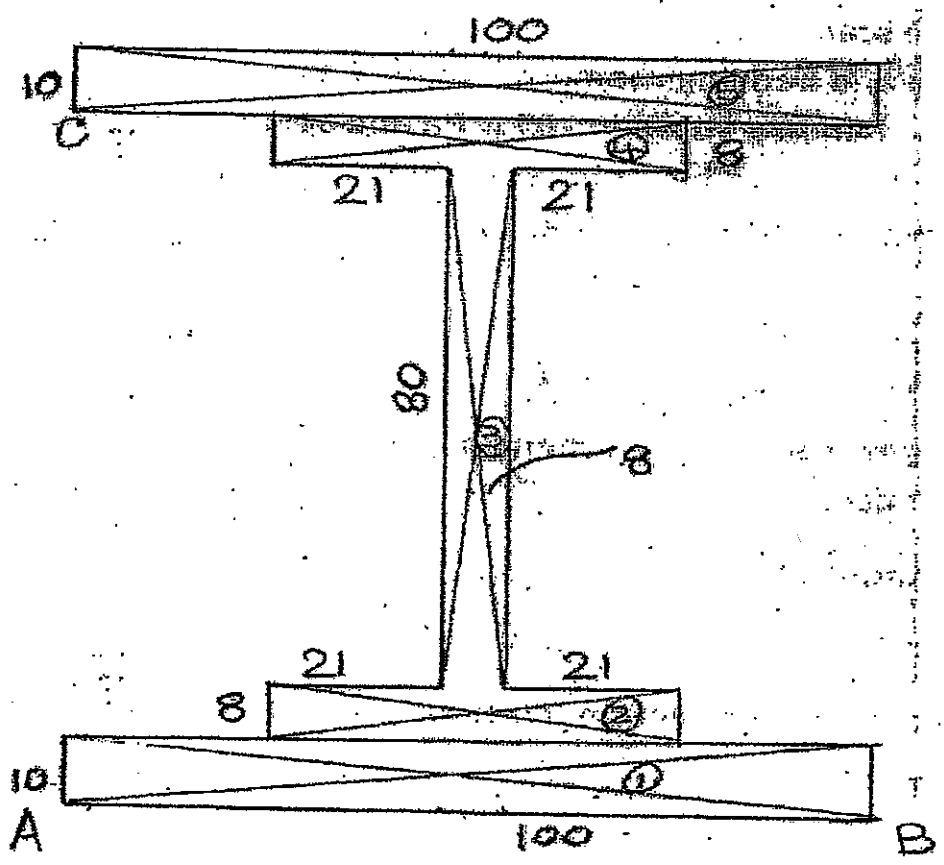

FIGURE 2

DIAGRAM SHEET 2

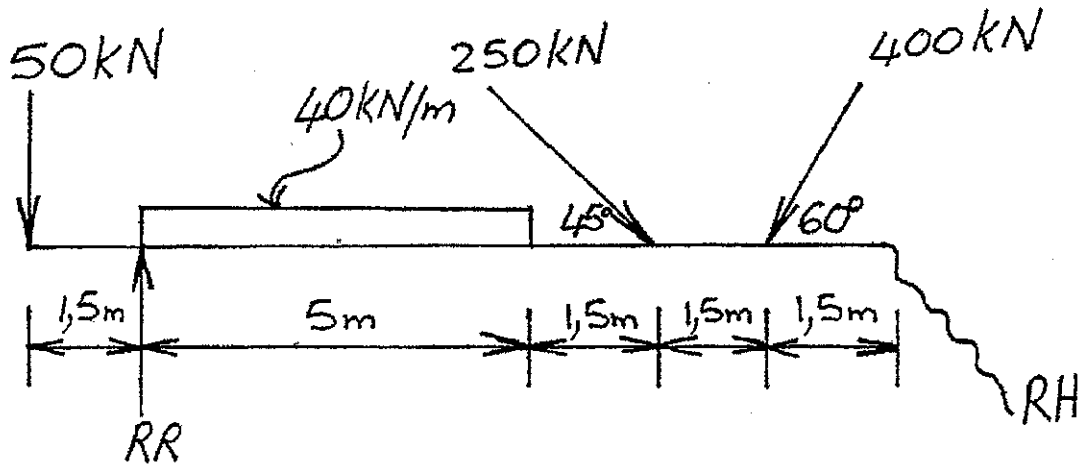

FIGURE 3

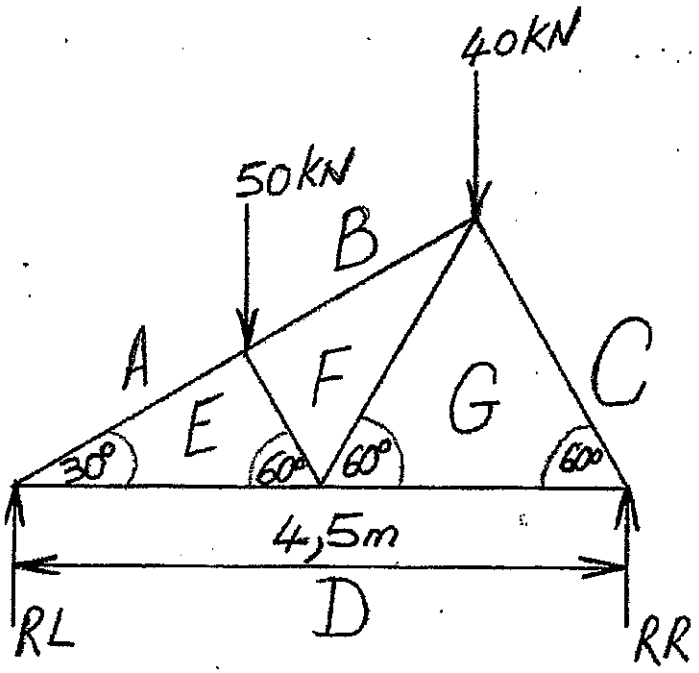

FIGURE 4