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higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

BUILDING SCIENCE N3

(15070023)

2 April 2020 (X-paper)

09:00–12:00

This question paper consists of 7 pages and 1 formula sheet.


062Q1A2002

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 according to the numbering system used in this question paper.
 4. Round off intermediate and final calculations to TWO decimal places.
 5. Start each section on a new page.
 6. Use only a black or blue pen.
 7. Write neatly and legibly.
-

QUESTION 1

- 1.1 Name THREE types of paint used in construction. (3)
 - 1.2 Differentiate between *hard water* and *soft water*. (2)
 - 1.3 List THREE types of concrete.  (3)
 - 1.4 What is the purpose of a primer? (2)
- [10]**

QUESTION 2

2.1

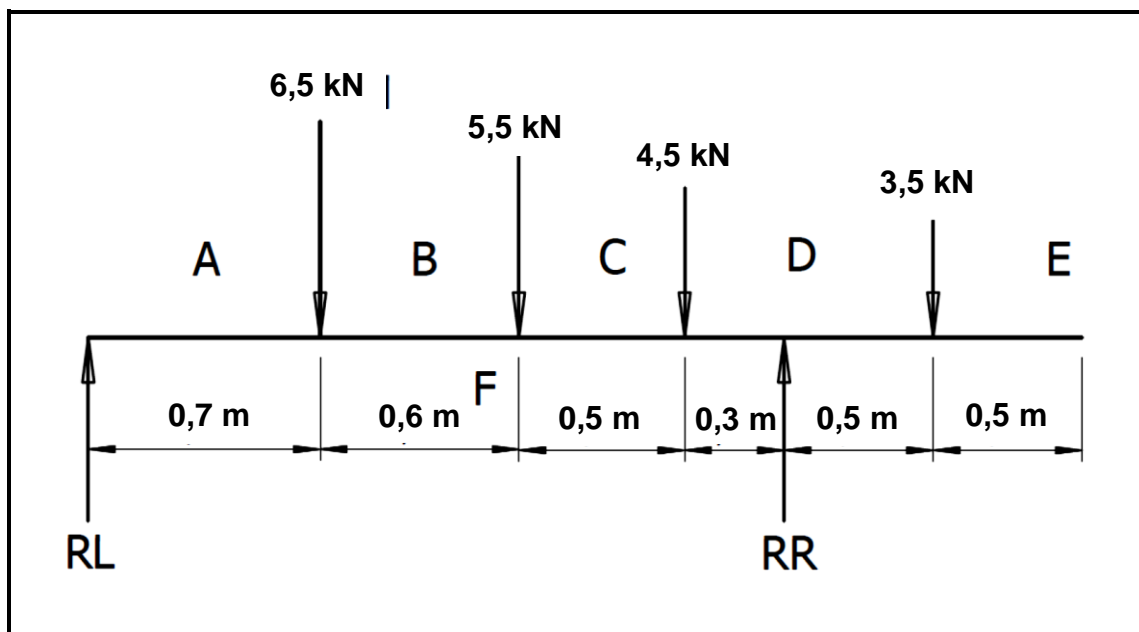



FIGURE 1



- Use the graphical or analytical method to determine the magnitude of reactions at the supports for a beam loaded as shown in FIGURE 1. (8)
 - 2.2 Draw a shear-force diagram to a suitable linear and force scale.  (6)
 - 2.3 Draw a bending moment diagram to a suitable linear and moment scale. (6)
- [20]**

QUESTION 3

A simply supported truss is loaded as shown in FIGURE 2.

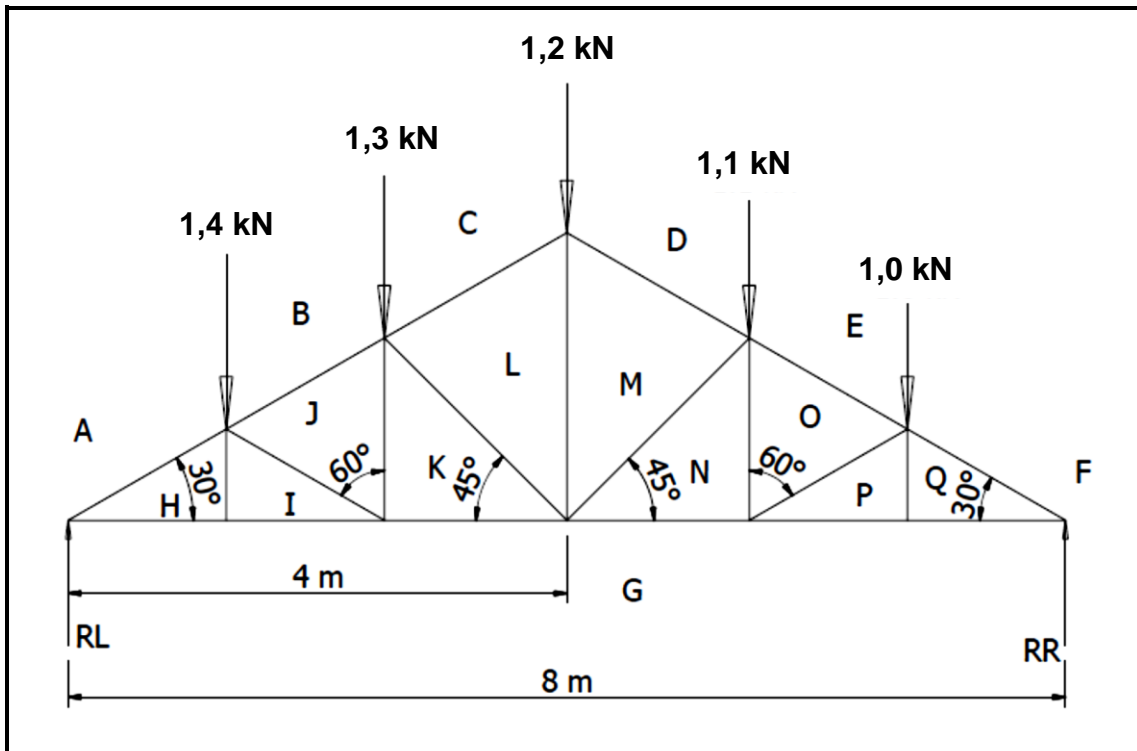


FIGURE 2

3.1 Use the graphical or analytical method to determine the magnitude of reactions RL and RR respectively. (6)



3.2 Draw a vector diagram to determine the magnitude and nature of only the member forces tabulated below.

MEMBER	MAGNITUDE	NATURE
AH		
BJ		
CL		
GH		
HI		
IJ		
JK		
GI		
KL		
LM		
GK		

(14)
[20]



QUESTION 4

4.1 Define the term *moment of area*.  (2)

4.2 FIGURE 3 shows a plane lamina of which the centroid must be calculated.

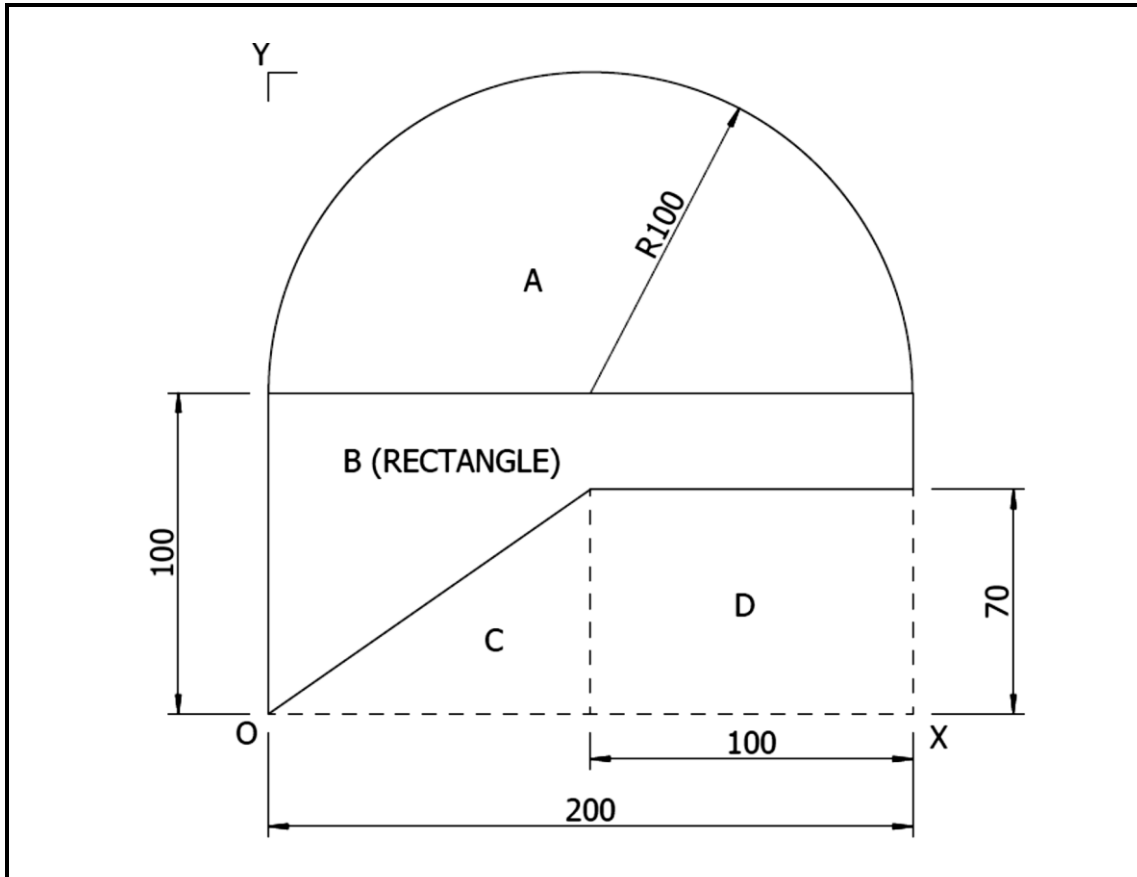



FIGURE 3

Do the necessary calculation to determine the position of the centroid with respect to OX and OY respectively. All measurements are in millimetres.

(18)
[20]

QUESTION 5

- 5.1 Define *Ohm's law*. (2)
- 5.2 What is the purpose of the earth wire in an electrical circuit? (2)
- 5.3 FIGURE 4 shows a parallel circuit. 

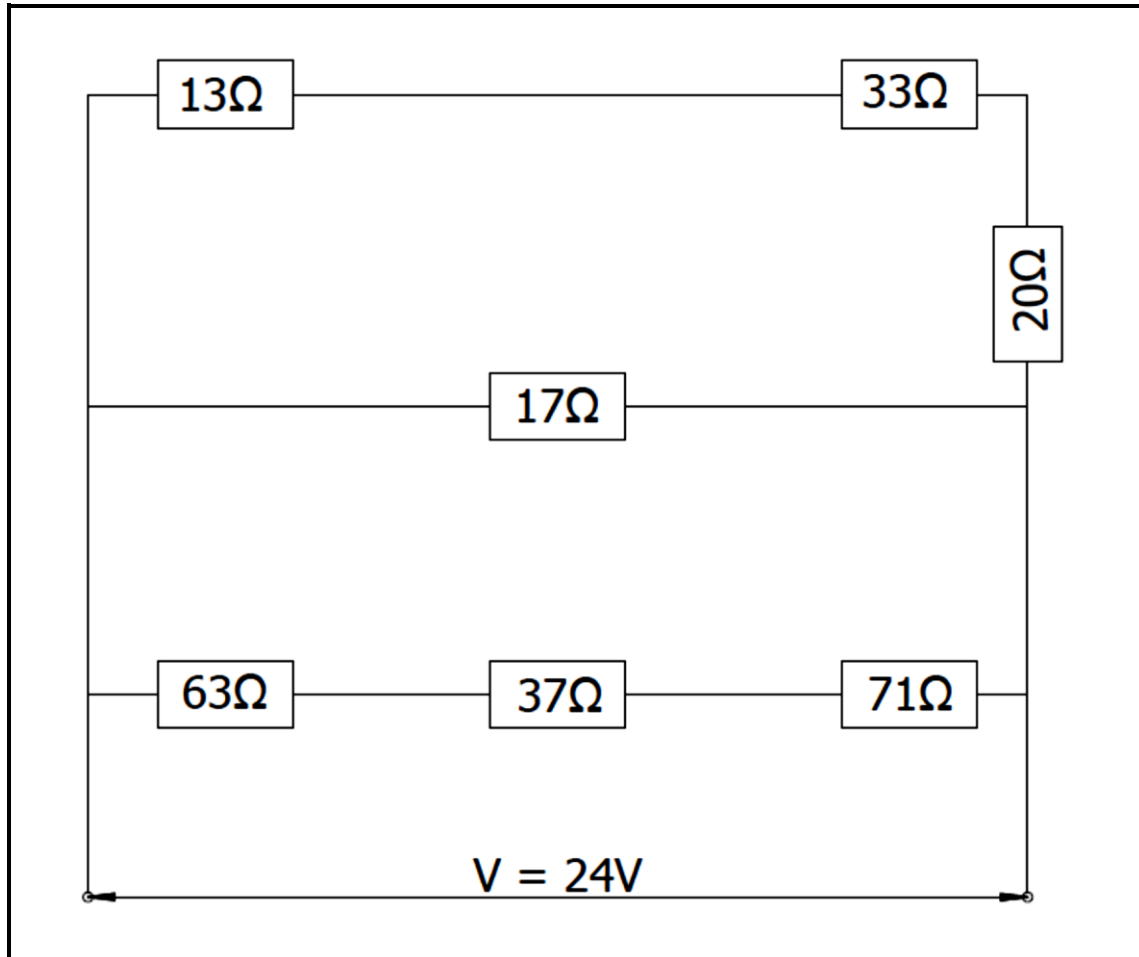


FIGURE 4

Calculate the total resistance in the circuit. (6)
[10]


QUESTION 6

A pair of sheer legs has legs 7 m each with bases 4 m apart. A 12 m backstay stabilises the sheer legs where a 35 kN load is hung from the apex. The apex hangs the load 3 m beyond the base of the sheer legs.



Graphically determine the forces acting in each sheer leg. Use a linear scale of 1 cm:1 m and a force scale of 1 cm:15 kN. [10]

QUESTION 7

- 7.1 Define *mechanical advantage*. (2)
- 7.2 There are number of terms used when working with simple machines. These terms are Work Done, Velocity Ratio and Efficiency. For each term do the following:
- 7.2.1 Define Work Done in words and write its units of measurement. (2)
- 7.2.2 Define Velocity Ratio in words and write its unit of measurement. (3)
- 7.2.3 Define efficiency in words and write its unit of measurement.  (3)
- [10]**
- TOTAL: 100**

FORMULA SHEET

Any other 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. * = $W \sin \phi$

6. Comp. $\zeta = W \cos \phi$

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. $VR = \frac{\text{Effort distance}}{\text{Load distance}}$

16. $MA = \frac{\text{Load}}{\text{Effort}}$

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. $WD = F \times S$

24. $MOM = F \times \zeta S$

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. $\bar{x} = \frac{4r}{3\pi}$

30. $\bar{x} = \frac{1}{3}h$

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

32. $\tan \phi = \frac{VC}{HC}$

33. Mass of water in mixture =
water: cement ratio \times mass of cement

34. Work done by effort in raising the load =
effort \times velocity ratio (VR) \times load distance