



UNIVERSITY OF JOHANNESBURG
FACULTY OF EDUCATION
NOVEMBER EXAMINATION 2015

PROGRAMME: B ED SENIOR PHASE
MODULE: TECHNOLOGY EDUCATION 2B
CODE: TEG2B20
TIME: 2 hours
MARKS: 100
EXAMINER: Dr CF van As
MODERATOR: Mr W Engelbrecht

(This paper consists of 4 pages)

INSTRUCTIONS:

1. Answer all the questions.

QUESTION 1

- 1.1 Write down the classification of structures, in column format, and name TWO examples of manmade structures under each. (9)
- 1.2 Briefly describe the minimum requirements for a successful structure, for example a building. (4)
- 1.3 From time to time something goes wrong with a design and a structure, for example a bridge collapses or fails to do its job. Give a brief description of what might cause structural failure. (4)

QUESTION 2

A structure's centre of gravity has a lot to do with its stability. Discuss this fact by answering the following questions:

- 2.1 Briefly define the concept centre of gravity. (2)
- 2.2 When is a structure described as stable? (2)
- 2.3 How will the position of a structure's centre of gravity influence its stability? (6)

QUESTION 3

- 3.1 Figure 1 shows a diagram of a frame structure. Study the diagram and answer the following questions:

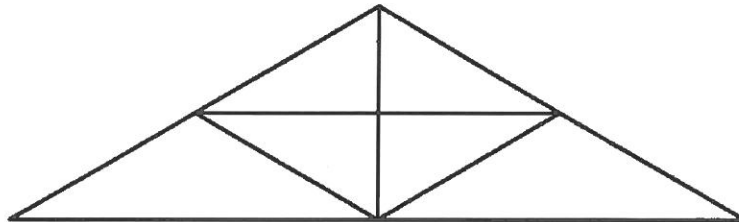


Figure 1

- 3.1.1 Use the formula $m = 2j - 3$ to find out whether the frame structure is hyperstatic or unstable. (4)
- 3.1.2 Copy the frame structure in your answer book and show how you will make it a perfect frame. Use the above mentioned formula to motivate your actions. (5)
- 3.1.3 Which term describes these actions? (2)
- 3.2 What do we call a member of a frame structure that is under compression? (1)
- 3.3 What do we call a member of a frame structure that is under tension? (1)
- 3.4 Briefly describe the concept gusset plate and state where it can be used. (3)

QUESTION 4

- 4.1 A beam's ability to resist bending depends on the material from which it is made as well as the sectional profile of the beam. Which one of the following timber beams will be the stiffest? Show the necessary calculations.
- 4.1.1 A beam with a width of 20cm and a depth of 3cm.
- 4.1.2 A beam with a width of 2cm and a depth of 10cm. (5)
- 4.2 Figure 2 shows a beam with two known forces and a pivot point in the centre of the beam. Calculate how much force must be applied to B to balance the beam? Use the following formula to guide your calculation:
moment = force x distance. (4)

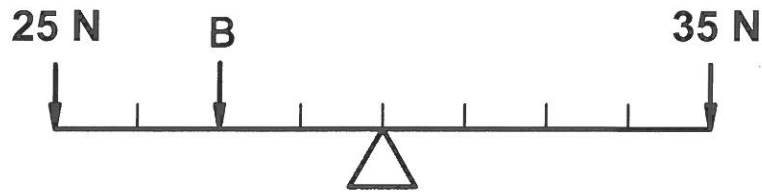


Figure 2

QUESTION 5

Briefly explain each of the following concepts applicable to building construction:

- 5.1 dead loads;
- 5.2 live loads;
- 5.3 wind loads;
- 5.4 thermal loads.

(8)

QUESTION 6

- 6.1 Name THREE factors that should be considered when designing a foundation system for a building. (3)
- 6.2 Figure 3 shows the reinforced concrete skeleton of a building. Study the sketch and answer the following questions:

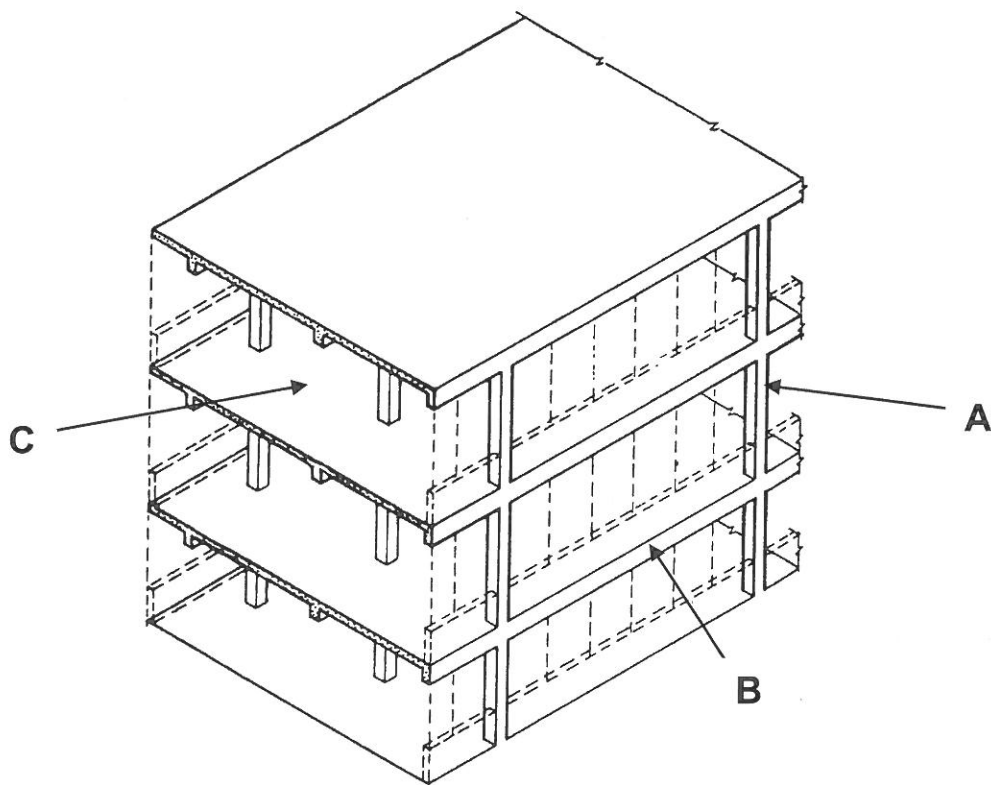


Figure 3

- 6.2.1 Write down the numbers A, B and C and name the specific structural element. (3)
- 6.2.2 What is the primary function of A? (2)
- 6.2.3 What is the primary function of B? (2)
- 6.2.4 Draw B in your answer book and show the forces acting on it when a uniform load is applied from above. (3)
- 6.2.5 Show how you would reinforce B. (2)

QUESTION 7

- 7.1 Name the three basic materials used to make clay bricks. (3)
- 7.2 Name any TWO properties of fired clay-bricks. (2)
- 7.3 Name any TWO uses of solid timber in ordinary house construction. (2)
- 7.4 Which properties make aluminum extremely suitable for the design of portable structures? (2)

QUESTION 8

- 8.1 Briefly describe the function of each of the following ingredients that are used in concrete:
- 8.1.1 Cement;
 - 8.1.2 Aggregates;
 - 8.1.3 Water. (6)
- 8.2 Where possible, concrete structures are built in an arch or dome shape. Explain why? (2)
- 8.3 Give one example to prove the statement given in Question 8.2. (1)
- 8.4 Briefly explain the concept hydration. (2)
- 8.5 What is the aim of the cube test on a building site? (2)
- 8.6 Give THREE reasons why steel and concrete work well together to form reinforced concrete. (3)

TOTAL: 100