



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN BUILDING CONSTRUCTION TECHNOLOGY

BCECD 212: STRENGTH OF MATERIALS II

DATE: 2/8/2019

TIME: 2.00-4.00 PM

INSTRUCTIONS:

- This paper consists of **Five** questions.
- Answer question **ONE** and any other **TWO** questions
- Maximum marks for each part of the question are as shown.

QUESTION 1 (COMPULSORY)

- a) Figure 1 shows a simply supported rectangular beam 100mm wide X 200mm deep, spanning 4m and carrying a concentrated load of 10kN.

Determine the maximum bending stress induced in the beam.

(10 marks)

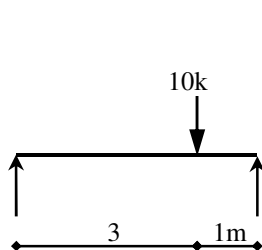


Fig.

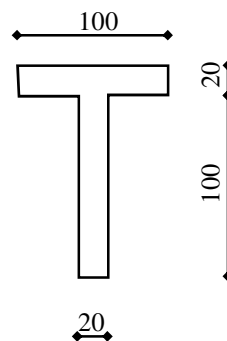


Fig.

- b) A beam with a cross section as shown in figure 2 is simply supported and carries a bending moment of 6kNm.

Determine:

The maximum tensile stress

The maximum compressive stress

(10 marks)

- c) The retaining wall shown in figure 3 weighs 22kN/m^3 . Calculate the factor of safety against overturning. (10 marks)

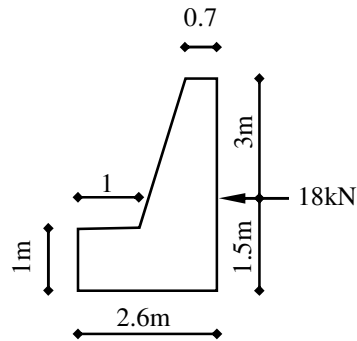


Fig. 3

QUESTION 2

A trapezoidal retaining wall having a section as shown in figure 4 weighs 22kN/m^3 and retains on its vertical face soil having a density of 16kN/m^3 and an angle of repose of 30° . The retained soil carries a superimposed vertical load of 9.6kN/m^3 .

Check the stability of the dam with respect to:

- a) Overstressing
- b) Overturning
- c) Sliding

Take μ as 0.6

(20 marks)

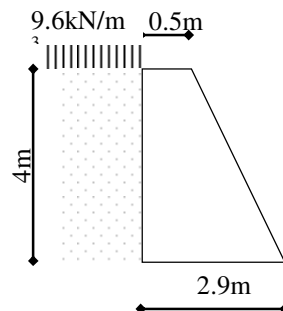


Fig. 4

QUESTION 3

A horizontal cantilever beam 2m long has a T shaped section as shown in figure 2. It carries a uniformly distributed load of 10kN/m along its entire length. Calculate the maximum tensile and compressive stresses. (20 marks)

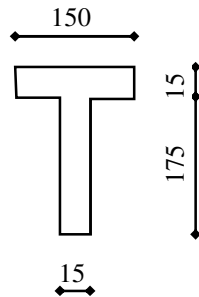


Fig. 2

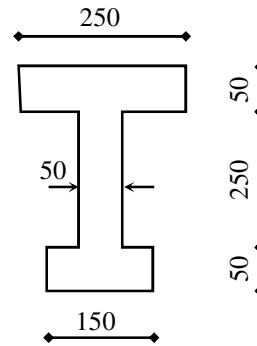


Fig. 3

QUESTION 4

An I - section beam has a cross section as shown in figure 3. It carries a vertical shear force of 100kN. Calculate the shear stress at important points
Draw the shear stress distribution diagram over the depth of the section. (20 marks)

QUESTION 5

A composite beam consists of a timber section 75mm wide and 150mm deep with a 6mm thick steel plate securely fixed to the bottom face.

- Calculate the maximum stress in both timber and steel if the section is subjected to a sagging moment of 5kNm.
 $E_s = 200\text{kN/mm}^2$; $E_t = 12\text{kN/mm}^2$
- If the steel stress must not exceed 120N/mm^2 and the timber stress must not exceed 14N/mm^2 , determine the maximum moment that the beam can bear. (20 marks)