



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

SECOND YEAR SECOND SEMESTER EXAMINATION FOR
DIPLOMA IN CIVIL ENGINEERING

BCECD 212: STRENGTH OF MATERIALS II

DATE:

TIME:

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 ONE (COMPULSORY) (30 MARKS)

- a) State Four assumptions made in the theory of simple bending. (4 marks)
- b) A rectangular beam 150mm wide X 300mm deep is simply supported over a span of 3.6m. Determine the uniformly distributed load that the beam can carry if the bending stress is not to exceed 25N/mm^2 (8 marks)
- c) The retaining wall shown in figure 1 weighs 22kN/m^3 . Calculate the factor of safety against overturning. (10 marks)

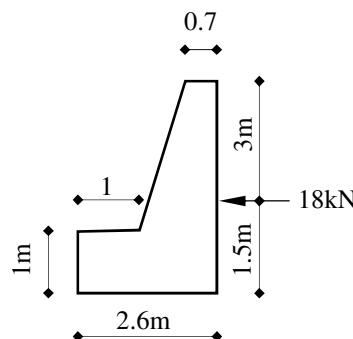


Fig. 1

- d) An I - section beam 300mm deep X 150mm wide has a web thickness of 15mm and a flange thickness of 20mm. It carries a shearing force of 100kN at a section. Determine :
 The maximum shear stress
 Draw the shear stress distribution diagram over the depth of the section. (8 marks)

QUESTION TWO (20 MARKS)

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)

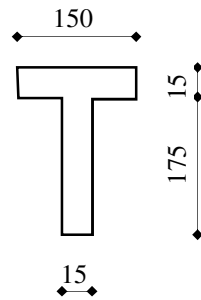


Fig. 2

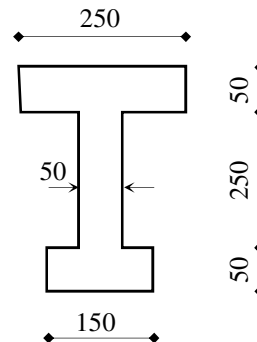


Fig. 3

QUESTION THREE (20 MARKS)

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.

QUESTION FOUR (20 MARKS)

A reinforced concrete retaining wall, as shown in figure 2, supports a cohesion-less soil having a unit weight of 18kN/m^3 and an angle of shearing resistance of 32° . Determine:

- The maximum and minimum ground bearing pressures
 - The factor of safety against overturning
 - The factor of safety against sliding if the coefficient of friction is 0.4
- Unit weight of concrete = 24kN/m^3

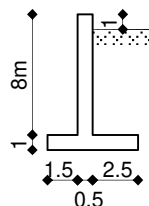


Fig. 4

QUESTION FIVE (20 MARKS)

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

- a) Calculate the maximum stress in both timber and steel if the section is subjected to a sagging moment of 5kNm.
 $E_s = 200\text{kN/mm}^2$; $E_t = 12\text{kN/mm}^2$
- b) 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.