



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

DIPLOMA IN CIVIL ENGINEERING (DC 10A)
DIPLOMA IN ARCHITECTURE (DA 10A)
DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBC 10A)

EBC 2211: STRENGTH OF MATERIALS II

END OF SEMESTER EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Calculator*

This paper consists of **FIVE** questions

Answer question **ONE** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

SECTION A (COMPULSORY)

Question 1

$$\frac{1.5Q}{bd}$$

a) Show that the maximum shearing stress in a rectangular beam section given by

Where: Q = maximum shear force
 b = breadth of section
 d = depth of section

(8 marks)

b) Figure 1 shows a retaining wall with a surcharge of 14KN/m². Using the data below determine:

- (i) Whether tension occurs in the base
- (ii) The maximum and minimum pressure under the base
- (iii) The factor of safety against sliding

Data: Density of soil = 1900 kg/m³
Density of concrete = 2400 kg/m³
Angle of shearing resistance = 29°
Angle of wall friction = 29°

(22 marks)

Fig 1.0

Note: Dimension in metres

SECTION B (Answer any TWO questions from this section)

Question 2

A simple supported beam whose cross-section is shown fig 2.0 carries an uniformly distributed load of 30KN/m. Over the entire span of 6M. Sketch the horizontal shear stress distribution diagram indicating all the critical values. (20 marks)

Fig 2.0

20

Question 3

Determine the maximum uniformly distributed load which can be carried by the beam whose cross-section is shown in fig 3.0. if it spans 6m and given that the permissible bending stress in the steel is to be 140N/mm^2 . Take : $E_{\text{steel}} = 210\text{KN/mm}^2$ and $E_{\text{timber}} = 8.75\text{KN/mm}^2$ (20 marks)

Fig 3.0

timber

Question 4

Fig 4.0 below shows an unreinforced concrete beam section. Determine the maximum bending moment which would be applied to the section in the plane of the web if the tensile and compressive stresses are limited to 14 and 1.4 N/mm^2 respectively (20 marks)

Fig 4.0

3200mm

Question 5

Fig 5.0 shows a flitched beam consisting of two timber joists 150mm x 50mm and a steel plate of 120mm x 10mm bolted securely between them. The beam is to be simply supported over a span of 5m and carries a udl of 1.2KN/m. Determine the maximum and minimum bending stresses in the materials given the following

$$\text{E}_{\text{steel}} = 210 \text{ KN/mm}^2$$

$$\text{E}_{\text{timber}} = 8.4 \text{ KN/mm}^2$$

(20 marks)

Fig 5.0

120mm