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 10B)
DIPLOMA IN ARCHITECTURE (DA 10B)
DIPLOMA IN BUILDING & CIVIL & CIVIL ENGINEERING (DBC 10B)
CERTIFICATE IN ARCHITECTURE (CA 10B)

EBC 2202: THEORY OF STRUCTURES I

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 **THREE** printed pages

SECTION A (COMPULSORY)

Question 1

Fig 1 shows a universal beam section strengthened by the addition of a steel plate at the top. Determine the actual stresses at point A, B, C and D if a force of 400KN acts on the section as shown

The properties of the U.B. are:

D = 310.4 mm

A = 60.8 cm^2
Ixx = 9485 cm^4
Iyy = 438 cm^4
B = 125.2 mm

The indicated axes xx-and yy are for the universal beams (30 marks)

Fig 1.0

Y

SECTION B (Answer *any TWO questions from this section*)

Question 2

Determine deflection under each point load of the beam in fig 2.0. Using Macaulay's method. Take E= 2.0 X $10^5 N/mm^2$, I = $10^9 mm^4$ (20 marks)

Fig 2.0

A

Question 3

a) State FOUR assumptions upon which Euler's formula is based

b) A Tubular pin-jointed strut 3m long has an outer and inner diameter of 37.5mm and 32.5mm respectively. Compare the crippling loads given by Eulers and Rankine's formula for the strut given the following:

Yield stress = 330 N/mm^2
Young's modulus = 210 KN/mm^2
Rankine's Constant = 1/7500 (20 marks)

Question 4

A masonry pier of 3m x 4m supports a vertical load of 80KN as in fig 3.

a) Find the stress developed at each corner of the pier.

b) What additional load should be placed at the centre of the pier, so that there is no tension anywhere in the pier section.

c) What are the stresses at the corners with additional load in the centre (20 marks)

Fig 3.0

Y

Question 5

a) A hollow alloy tube 5m long with diameter 40mm and 25mm respectively was found to extend 6.4mm under a tensile load 60KN. Find the buckling load for the tube when used as a strut with both ends pinned. Also find the safe load on the tube taking factor of safety as 4.

b) Obtain expressions for the slope and deflection at the free end of a cantilever carrying a uniformly distributed load as shown in fig. 4 (20 marks)

Fig 4.0

w/unit length