TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 12S)
DIPLOMA IN ARCHITECTURE (DA 12S)

EBC 2202: THEORY OF STRUCTURES I

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER/NOVEMBER 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer Booklet*
- *Mathematical tables/Calculator*

This paper consists of **FIVE** questions.
Answer any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One

a) A universal column section acting as a stanchion carries an axial and two further loads from incoming beams supported on brackets. The arrangement of loads may be assumed to be as that shown in figure 1. Determine the extreme fibre stresses acting at the corners, B, C and D. Properties of the universal column section.

D = $11,400mm^2$

Ixx = $143 \times 106mm^4$

Iyy = $48 \times 106mm^4$ (12 marks)

X

b) A rectangular strut is 150mm wide x 120mm thick. It carries a load of 180KN at a eccentricity of 10mm in the plane by bisecting the thickness. Find the maximum and minimum intensity of stress in the section.

Question Two

A horizontal beam of uniform section and 6m long is 5.5 at its ends. Two concentrated loads of 48KN and 40KN at 1m and 3m respectively from the left hand support. Determine the position and magnitude of the maximum deflection if:

$E = 200GN/m^2$ and $I = 85 \times 10^{-6}m^4$ (20 marks)

Question Three

A hollow alloy tube, 5m long with diameter 40mm and 25mm under a tensile load 600KN. Calculate 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. (20 marks)

Question Four

A column 3m long hinged at its both ends is made up of two channels ISJC 200 and 225cm x 1cm flange – plates as shown in figure 3

1cm

Determine the maximum eccentricity for a load 40 tonnes from Y – Y axis, if the maximum permissible stress is 800kg/cm^2, take E = 2 X 10kg/cm^2. The properties of channel section are:

A = 17.77cm^2

Iyy = 84.2cm^4

Distance of centroid from back of web = 1.97cm

Question Five

a) State Mohr's theorem for slope and deflection.

b) Figure 4 shows a loaded cantilever beam using Mohr's theorems, determine the deflection at points B, C and slope at C in terms of EI

C