TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (CBCE 13M)

EBC 2202: THEORY OF STRUCTURES I

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer any **THREE** questions of the **FIVE** questions
Maximum marks for each part of a question are as shown
Use neat, large and well labeled diagrams where required

This paper consists of **THREE** printed pages

Question One

A hollow tube of external and internal diameters 40mm and 25mm respectively extends 5.0mm extends under a tensile force of 150KN. The actual length of the strut is 4.5m. The strut is fully fixed at top and bottom. Determine the Euler buckling load:

Esteel = $270KN/mm^2$

I = Constant **(20 marks)**

Question Two

a) State the assumptions in the Euler Theory of struts **(6 marks)**

b) Illustrate diagrammatically Euler Load for various end conditions of restraint **(6 marks)**

c) An I-section in figure 1 is used as a strut. The strut is fully fixed at bottom but pinned at top. Determine the Euler crippling load. Take Esteel = $206KN/mm^2$ **(8 marks)**

Fig 1

Question Three

An I-section in figure 2 is as strut. The strut is subjected to both axial an eccentric loading. Determine actual stresses at point A, B, C and D

Data:
D = 222.23mm
$I_{xx} = 9462cm^4$
$I_{yy} = 311.9cm^4$
$A = 110.1cm^2$
B = 208.8mm **(20 marks)**

e_y = 20mm

Question Four

A T-section is used as a strut. The actual length 4.0m and fully fixed at bottom but pinned at top. Determine the Euler crippling load E_{steel} = 210KN/mm^2

180mm

Question Five

Determine the Euler crippling load for a cylindrical section of 40mm and 20mm diameters respectively. The actual length is 5.0mm and is fully fixed at both ends.

Esteel = 210KN/mm^2

I = Constant **(20 marks)**