TECHICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

CERTIFICATE IN BUILDING & CIVIL ENGINERING

EBC 1104: COLUMNS, STRUTS & COMBINED FORCES

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: FEBRUARY 2013
TIME: 2 HOURS

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Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*
- *Scientific 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 hollow alloy tube 5m long with diameter 4cm and 2.5cm respectively was found to extend 6.4mm under a tensile load of 6 tonnes. 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.
        (20 marks)

Question Two

a) State **FOUR** assumptions upon which Euler's formula in based.

b) Figure 1 shows a built-up column consisting of 150mm x 100mm R.S.J with 120mm x 12mm plate riveted to each flange.

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   Calculate the safe load, the column can carry, if is 4m long having one end fixed and the other hinged with a factor of safety 3.5. Take the properties of the joist as: Area = 2167mm^2, Ixx = 8.391 x 10^{6}mm^4 Iyy = 0.948 x 10^{6}mm^4. Assume the yield stress as 315Mpa and Rankine's constrant (a) = 1/7500   **(20 marks)**

Question Three

Compare the ratio of the strength of a solid steel column to that of a hollow of the same cross-section area. The internal diameter of the hollow column area. The internal diameter of the hollow column is 0.75 of the external diameter. Both the columns have the same length and are pinned at both ends.
                                                                                        (20 marks)

Question Four

In a tension specimen 13mm in diameter the line of pull is parallel to the axis of the specimen but is displaced from it. Determine the distance of the line of pull from the axis. When the maximum stress is 15 percent greater than the mean stress on a section normal to the axis.   **(20 marks)**

Question Five

A hollow rectangular masonry pier is 1.2m x 0.8m wide and 150mm thick. A vertical load of 2MN is transmitted in the vertical plane bisecting 1.2m side and at an eccentricity of 100mm from the geometric axis of the section. Calculate the maximum and minimum stress intensities in the section.

                                                                                                                        (20 marks)