TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

EBC 2202 : THEORY OF STRUCTURES I

SPECIAL SUPPLEMENTARY EXAMINATION
SERIES: JULY 2017
TIME: 2 HOURS
DATE: Pick Date Sep 2017

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

- Pocket calculator

This paper consists of **FIVE** questions. Attempt any THREE questions.

Do not write on the question paper.

Mobile phones are not allowed in the examination room.

QUESTION ONE

(a) (i) Define a strut.

(ii) Outline **three** assumptions in the Euler's column theory. **(4 marks)**

(b) A hollow alloy tube 4m long with external and internal diameter of 40 and 25 mm respectively was found to extend 4.8 mm under a tensile load of 60 KN. Find the buckling load for the tube with both ends pinned. Also find the safe load on the tube, taking the factor of safety as 5.

(10 marks)

(c) A copper wire of 2mm diameter is required to be wound around a drum. Find the minimum radius of the drum if the stress in the wire is not to exceed 80 Mpa. Take modulus of elasticity for the copper as 100Gpa**.** **(6 marks)**

QUESTION TWO

(a) A steel rod 10m long and of 50mm diameter is used as a column, with one end fixed and the other free. Determine the crippling load by Euler's formula. Take E as $205x10^3$ n/mm^2.

(5 marks)

(b) A hollow rectangular masonry pier is 1.2m x0.8m wide and 150mm thick. A vertical load of 2MN is transmitted in the vertical plane bisecting 1.2m wide and at an eccentricity of 100mm from the geometric axis of the section. Calculate the maximum and minimum stress intensities in the section. **(15 marks)**

QUESTION THREE

(a) For columns with both ends hinged, show that the critical load 'P' is given by the formula

$$\mathbf{P} = \frac{\prod^2 \mathbf{EI}}{L^2}$$ **(15 marks)**

(b) A metallic rod of 10mm diameter is bent into a circular form of radius 6m. If the maximum bending stress developed in the rod is 125 n/mm^2, find the value of Young's modulus for the rod material. **(5 marks)**

QUESTION FOUR

A T-section 150mmx120mmx20mm a shown in figure 1 is used as a strut of 4m long with hinges at its both ends. Calculate the crippling load, if Young's modulus for the material is to be 200Gpa.

(20 marks)

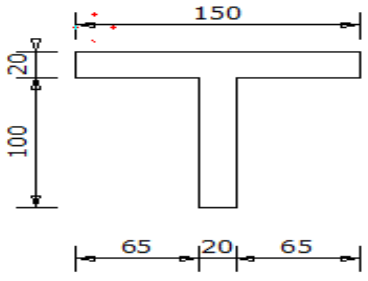

Fig.1

QUESTION FIVE

(a) Find the Euler's crippling load for a hollow cylindrical steel column of 38mm external diameter and 2.5mm thick. Take length of the column as 2.3 m and hinged at its both ends. Take E=205Gpa.Also determine crippling load by Rankine's formula using constants as 335Mpa and $\frac{1}{7500}$. **(10 marks)**

(b) An I-section joist 400mmx200mmx20mm and 6m long is used as a strut with both ends fixed. Fin the Euler's crippling load for the column? Take Young's modulus for the joist as 200Gpa. **(20 marks)**