TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING & TECHNOLOGY

Department of ARCHITECTURE AND BUILT ENVIRONMENT

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ARCHITECTURE

DILOMA IN QUANTITY SURVEYING

EBC 2203 : THEORY OF STRUCTURES II

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: JULY 2025
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet,

-examination pass

-student ID

- Scientific Calculator

This paper consists of five questions.

Attempt any THREE questions.

Do not write on the question paper.

QUESTION ONE (20 Marks)

(a) Find the Euler's crippling load for a hollow cylindrical steel column of 38mm external diameter and 2.5mm thick. The length of the column is2.5m and is hinged at both ends. Take E as$205x10^3 mm^2$ (10 Marks)

(b) Determine crippling load by Rankine's formula given yield stress as 335 N/mm^2 Rankine constant as 1/7500. (10 marks)

QUESTION TWO (20 Marks)

(a) With the aid of sketches explain the fixing conditions of a column as per Euler crippling load . (6 Marks)

(b) A steel rod 5m long and 40mm diameter is used as a column with one end fixed and the other free. Determine the crippling load by Euler's Equation. Take E as 200x 10^3 N/mm^2. (14 Marks)

QUESTION THREE (20 Marks)

(a) State the assumptions made in the Euler's Column Theory. (6 Marks)

(b) A hollow tube 4.0m long with external and internal diameters of 40mm and 25 mm respectively was found to extend 4.8mm under a tensile load of 60KN. Determine;-

(i) Buckling load for the tube with both ends fixed.

(ii) Safe load on the tube given the factor of safety is 3. (14 Marks)

QUESTION FOUR (20 Marks)

A short column of rectangular cross-section 80mm by 60mm carries a load of 40 KN at appoint 20mm from the loner side and 35mm from the shorter side as shown in Fig 1. Determine the stresses at A, B, C and D. (20 Marks)

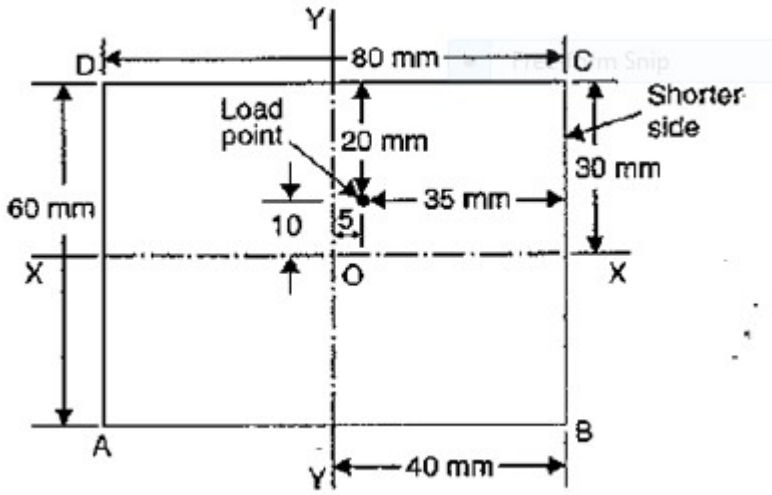

Figure 1

QUESTION FIVE (20 Marks)

(a) Fig 2 shows a concrete column with a base slab as shown. It is carrying eccentric load of 100 KN. Take the density of concrete to be 24KN/$M^{3.}$ Note consider the self-weight of the structure . (10 Marks)

(b) Determine the diameter of a short, circular column to support an axial load of 206KN.The working stress is 4.2 N/mm^2. (5 Marks)

(c) Given young's Modulus for concrete is 14000 $N/mm^{2,}$, determine the shortening of the column if the initial length is 300cm. (5 Marks)

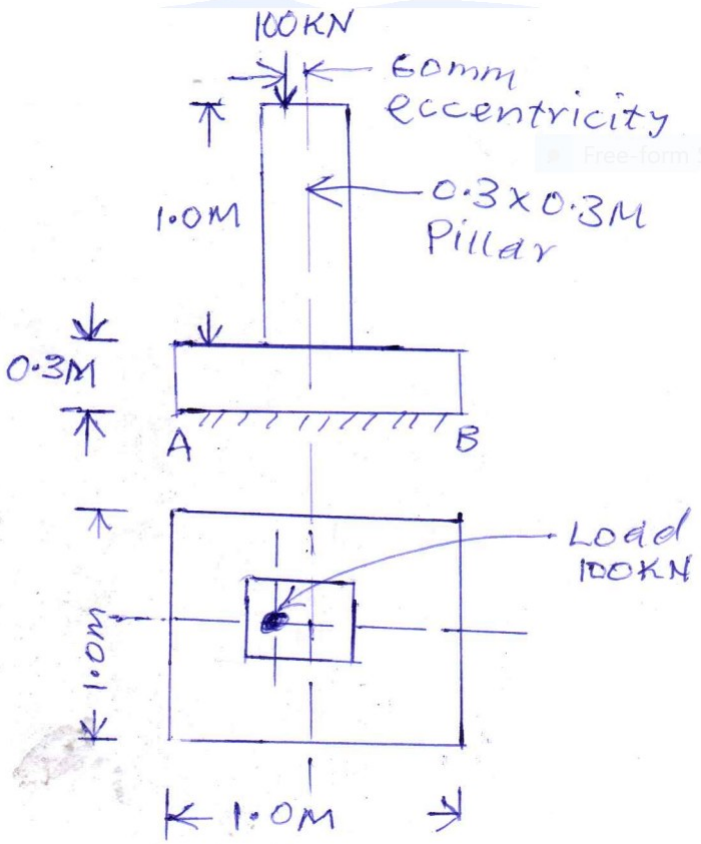
100KN
60mm
eccentricity
1.0M
0.3x0.3M
Pillar
0.3M
A
B
Load
100KN
1.0M
1.0M

Fig 2