TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING & TECHNOLOGY

Department of ARCHITECTURE AND BUILT ENVIRONMENT

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ARCHITECTURE

DIPLOMA IN QUANTITY SURVEYING

EBC 2203 : THEORY OF STRUCTURES II

END OF SEMESTER EXAMINATION
SERIES: APRIL 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) 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. (8 Marks)

(ii) Safe load on the tube given the factor of safety is 3. (6 Marks)

QUESTION TWO (20 Marks)

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

(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) 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 Rankines formula given yield stress as 335 N/mm^2 Rankine constant as 1/7500 . (10 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)

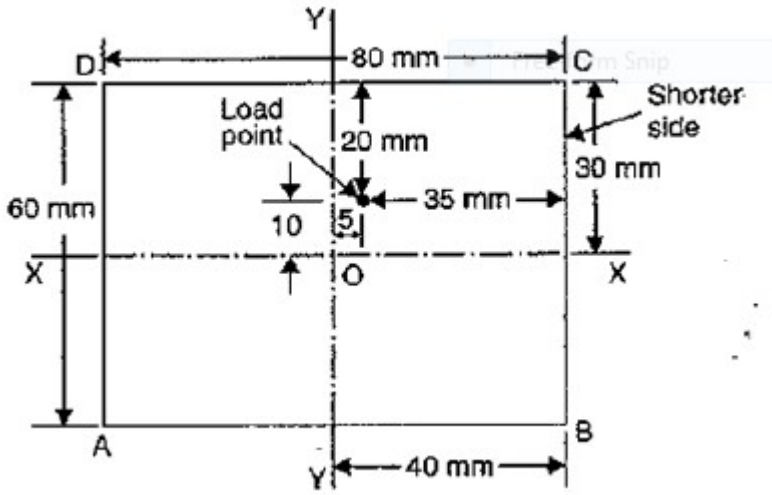

Figure 1

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) (i)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)

(ii) 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)

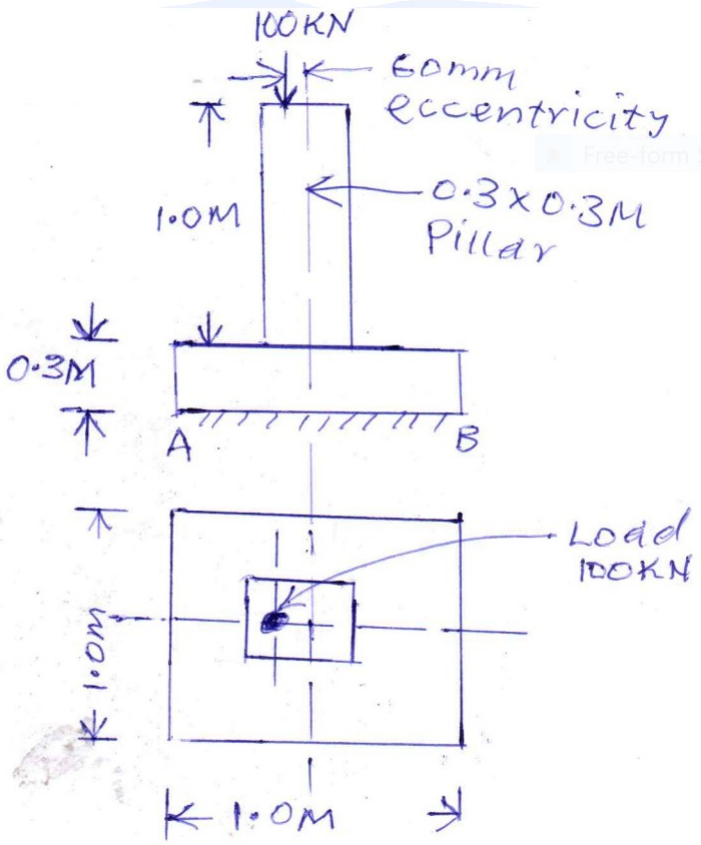
100KN
60mm
eccentricity
1.0M
0.3x0.3M
Pillar
0.3M
A
B
Load
100KN
1.0M
1.0M

Fig 2