



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of BUILDING & Civil engineering
UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING
ECV 4501 : STRUCTURAL DESIGN III

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2024
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY) 30 Marks

An un-braced R.C column 600 mm by 400 mm is subjected to an axial ultimate load of 2500 kN and bent in single curvature about the minor axis with $M_{y(top)} = 90$ kNm and $M_{y(bottom)} = 120$ kNm as ultimate moments. If $L_o = 7.2$ m and $L_e = 5.75$ m on both axes, calculate the design moments for the column.

Provide the detailed structural drawing for the column.

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 Marks)

A circular water tank 10m internal diameter and 6.5m high retains water to a depth of 6.0m. The base of the tank is designed to be free sliding. Design the reinforcement at the base and calculate the crack width.

QUESTION THREE (20 Marks)

Design a cantilever retaining wall to retain an earth embankment with a horizontal top 3.5 m above ground level. Density of earth is 18 kN/m^3 , angle of internal friction $\theta = 30^\circ$ and

soil bearing capacity is 200 kN/m^2 . Take coefficient of friction between soil and concrete to be 0.5. Adopt grade 25 concrete and high tensile steel. (20 Marks)

QUESTION FOUR (20 Marks)

- (a) Clearly discuss the five major basic types of inspections that can be performed on a bridge structure. (10 Marks)
- (b) Briefly discuss five types of concrete bridges. (10 Marks)

QUESTION FIVE (20 Marks)

A hospital building of size 50m by 100m and a height of 10m is proposed to be built at a place with basic wind speed of 39 m/sec. Determine the wind pressure on the building if the height of the hill is 320m with a slope of 1 in 4. The hospital is proposed at a distance 120m from the crest on the down ward slope.