# TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
**UNIVERSITY EXAMINATION FOR:**
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

**ECE 2502 : STRUCTURAL DESIGN III**
SPECIAL/SUPPLEMENTARY EXAMINATION
**SERIES:** SEP 2018
**TIME:** 2  HOURS
**DATE:** Sep 2018

## 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 $\theta = 30°$ 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 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.