TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2502: STRUCTURAL DESIGN III

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2HOURS

DATE: 10May2016

Instructions to Candidates
You should have the following for this examination
-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID
This paper consists of five questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

QUESTION ONE (30 Marks)

(a) Design the longitudinal steel for a braced column 500 x 400 mm bent in single curvature with f_{cu} = 40 N/mm² and f_y = 460 N/mm² and the following data: effective length about both axes = 6.5 m, unsupported length = 7m, factored load = 2500 kN, factored moments on major axis are 250 kNm at the top and 200 kNm at bottom. The factored moments about minor axis are 120 kNm at top and 100 kNm at the bottom.   (20 Marks)

(b) Briefly describe the steps involved in planning for construction of a bridge in a newly proposed route.   (10 Marks)

QUESTION TWO (20 Marks)

An industrial roof shed of size 20m by 30 m is proposed to be constructed at an area with basic wind speed of 39 m/sec near hillock of 160m and the slope is 1 in 2.8. The roof shed is to be built at a height of 120m from the base of the hill. Determine the design wind pressure of the slope. The height of the roof shed shall be 12m. (20 Marks)

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)

Design a simply supported reinforced concrete bridge deck slab using a unit strip method. The deck carries a 100 mm depth of surfacing together with a normal HA live load uniformly distributed load of 17.5 kN/m^2 and knife edge load of 33 kN/m. The deck should also be designed to carry 30 units of HB load. The span of the deck is 12.0 m center to center of bearings.

QUESTION FIVE (20 Marks)

A reinforced concrete un-braced column 300 by 500 mm with L_o = 9m, L_e = 6.75 m has $M_{y(top)}$ = 70 kNm and $M_{y(bottom)}$ = 10 kNm as ultimate moments and factored load of 1700 kN. If the column is bent in double curvature, determine the design moments (yy is the minor axis).