TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2515: STRUCTURAL DESIGN IV

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2HOURS

DATE: 16May2016

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

QUESTION ONE   (30 Marks)

A four storeyed multi-storey building frame has four equal bays of 4m each and the height between floors is 4m. The wind loads acting at roof level and various floor levels are, H1 = 5 kN, H2 = 10 kN, H3 = 10kN and H4 = 10kN. The columns have the same cross-section. Estimate the moments in the columns and beams using the cantilever method and draw the quantitative bending moment diagrams that the exterior and interior columns will experience.   (30 Marks)

QUESTION TWO

(a) Clearly discuss any three passive earthquake control systems that are currently used in reducing the intensity of dynamic actions on tall buildings. (9 Marks)

(b) Briefly discuss six general principles that have to be considered when designing structures to resist earthquake intensity. (11 Marks)

QUESTION THREE

The roof of an 8 m wide hall is supported on a portal frame spaced at 4 m intervals. The height of the portal frame is 4 m. The continuous slab is 120 mm thick. Live load on roof is 1.5 kN/m², soil bearing capacity of soil is 150 kN/m². The columns are connected with a plinth beam and the base of the column may be assumed as fixed. Design the slab, column, beam members and suitable footing for the columns of the portal frame. Adopt grade 20 concrete and high yield steel. (20 Marks)

QUESTION FOUR

The typical portal frame shown in Figure Q4 is to be used for as industrial shed. The ultimate load including dead and live load to be carried by the frame is 100kN/m. The horizontal reaction at the base of the column is found to be 293.7kN. The material properties are f_{cu} = 25 N/mm² and f_y = 460N/mm². The frames are spaced at 5 m intervals and the slab thickness is 120 mm. Determine the bending moments developed in the frame. (20 Marks)

QUESTION FIVE

Design for the column reinforcements for the portal frame shown in Figure Q4. (20 Marks)
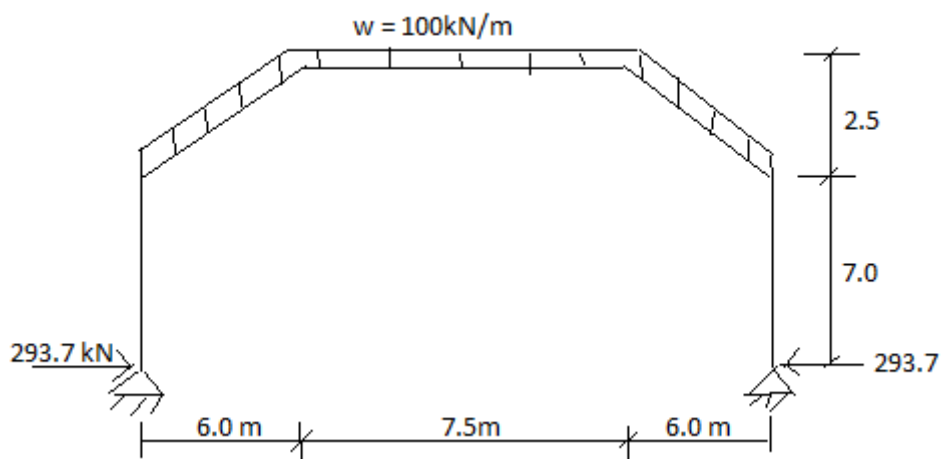

Figure Q4