TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
(BSCE)

ECE 2215: THEORY OF STRUCTURES II

END OF SEMESTER EXAMINATION
SERIES: APRIL 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer booklet*
- *Scientific Calculator*

This paper consists of **FIVE** questions.
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
All questions carry equal marks
Maximum marks for each part of a question are as shown
This paper consists of **TWO** printed pages

Question One (COMPULSORY)

a) A single point load of 80KN crosses a girder of 12m. Using influences lines. Find the maximum positive and negative shear force and bending moment at a point 4m from the left end.

(15 marks)

b) Using double integration method, show that for a cantilever with a uniformly distributed load, the maximum deflection is given by:

$$Y = \frac{WL^4}{8EI}$$

(10 marks)

c) Discuss the rules to be observed while using Macaulay's method for slope and deflection.
(5 marks)

Question Two

a) A cable is used to support six equal and equidistant loads over a span of 14m. The central dip of the cable is 1.6m and the loads are 20KN each. Find the length of the cable required and its cross-sectional area, if the safe tensile stress is 15 x 104KN/m^2. The distance between the loads is 2 metres.
(15 marks)

B

b) A wooden beam 140mm wide and 240mm deep has a span of 4m. Determine the load, that can be placed at its centre to cause the beam a deflection of 10mm. Take E as 6Gpa. **(5 marks)**

Question Three

A horizontal steel girder having uniform cross-section is 14m long and is simply supported at its ends. It carries two concentrated loads as shown in figure 3. Using Macaulay's method, calculate the deflections of the beam under the loads C and D. Take E =200Gpa and I = 160 x $10^6$$mm^4$ **(20 marks)**

B

Question Four

Using influence lines, derive and draw the bending moment diagram for a uniformly distributed load moving over three-hinged parabolic arch. **(20 marks)**

Question Five

a) A parabolic arch, hinged at springing and crown has a span of 30m and central rise 6m. Determine the magnitude of maximum positive and negative bending moment at a section 10m from left hand support, when a point load 90KN rolls over the beam. **(10 marks)**

b) A cantilever beam 100mm wide and 180mm deep is projecting 2m from a wall. Calculate the uniformly distributed load, which the beam should carry if the deflection of the free end should not exceed 3.5mm. Take E as 200Gpa. **(10 marks)**