



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR BACHELOR OF SCIENCE IN CIVIL
ENGINEERING (BSCE)

ECE 2307: THEORY OF STRUCTURES III

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2013

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet
- Mathematical table/Pocket calculator

This paper consists of **FIVE** questions.

Answer question **ONE (COMPULSORY)** in section **A** and any other **TWO** questions from section **B**

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

SECTION A

Question One (Compulsory)

- a) Using method of moment distribution, analyze the frame in figure 1a and plot the bending moment diagram indicating the critical values. Take $EI = \text{Constant}$. **(20 marks)**

Figure 1a

- b) A Two hinged parabolic arch in figure 1b of 30m span and 5m central rise has a varying second moment of area which is proportional to the secant of the slope of its neutral axis. It carries a point load of 15KN at a distance 10m from the left end. Determine the horizontal thrust, BM and radial shear force under the load. **(10 marks)**

Figure 1a below is a laterally restrained steel beam restrained at the ends and points of application of the loads. For the given loads, determine the size of grade 43 section required.

Figure 1 b

SECTION B (Attempt any TWO questions)**Question Two**

The structure shown in figure 2 is a statically indeterminate frame. Using method of consistent deformation, analyze the frame hence draw the bending moment diagram. **(20 marks)**

Figure 2

Question Three

- a) A udl of 10KN/m longer than the span rolls over a beam of 25m span. Using influence line, determine the maximum shear force and bending moment at a section 10m from the left end. **(10 marks)**

- b) A parabolic arch hinged at its springs of span 36m and rise of 8m is loaded as shown in figure 3b. Determine the values of horizontal thrust as well as maximum positive and negative bending moment. **(10 marks)**

18m

Question Four

- a) Figure 4 shows a loaded continuous beam ABCD 18m long fixed at A and D and continuous over support B and C. During loading, support B sunk 10mm. Using slope deflection method, analyze the beam and hence draw the BMD indicating the critical values.

Take: Moment of inertia of AB and CD = 2I

Moment of inertia of BC = I

$I = 160 \times 10^6 \text{mm}^4$

$E = 210 \text{KN/mm}^2$

(20 marks)

D

Question Five

- Using THREE MOMENT theorem, analyze the beam shown in figure 5 and hence draw the shear force and bending moment diagram indicating all the critical values. **(20 marks)**

Figure 5

