



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATIONS FOR BACHELOR OF
SCIENCE IN CIVIL ENGINEERING

ECE 2408 : THEORY OF STRUCTURES III

END OF SEMESTER EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Battery Powered Programmable Calculators may be used*

This paper consists of **FIVE** questions in **TWO** sections **A & B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

SECTION A (COMPULSORY – 30 MARKS)

Question 1

- a) (i) State the Muller – Breslau principle (2 marks)
- (ii) For the beam shown construct the influence line diagram for the reaction at F and the shear force just to the right of C giving all the ordinates at A, B, C, D, E and F. (6 marks)

Fig (a) (ii)

- (iii) Construct the qualitative influence line diagrams for the reaction at A, reaction at B, Moment at C and shear at C for the beam shown below (6 marks)

Fig 1 (a) (iii)

- b) Outline the **FOUR** basic steps in the moment distribution method (5 marks)
- c) A beam with a span of 8m is fixed at A and B. If it carries a uniformly distributed load of 5KN/m and support B settles by 2mm, calculate the moments at A and B. Take $E = 205\text{KN/m}^2$ and $I = 1.5 \times 10^8 \text{ mm}^4$ (6 marks)
- d) Using the method of consistent deformations; determine the reaction at B for the continuous beam shown below (5 marks)

Fig 1 (d)

SECTION B (Answer any TWO questions from this section. Each question carries 20 marks)

Question 2

The beam AF is supported at four points as shown in the figure below. Using the three moment equation analyse the beam and draw the bending moment and shear force diagrams if (a) the beam is pinned at A and (b) the beam just rests on A. (20 marks)

Fig 2

Question 3

Analyze the frame shown by the slope deflection method. Draw the bending moment diagram and evaluate all reaction. Take $E = \text{constant}$ (20 marks)

Fig 3

Question 4

The frame shown is of uniform modulus throughout, but the second moment of area of the stanchions is twice that of the beam BC. Calculate the bending moment at B and C (20 marks)

Fig 4

Question 5

Show that for the arch in the figure below, the horizontal thrust due to a uniformly distributed load of

$$H = \frac{wL^2}{8h}$$

$w/\text{KN/m}$ run over the whole span is $\frac{wL^2}{8h}$. (Assume the arch is parabolic and the flexural rigidity varies with the secant of the inclination α of the tangent to the rib to the x-axis at the point under consideration) (20 marks)

Fig 5