



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

INSTITUTIONAL BASED PROGRAMME

HIGHER DIPLOMA IN CONSTRUCTION
(1ST STAGE)

THEORY OF STRUCTURE II

SPECIAL/SUPPLEMENTARY EXAMINATIONS

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

This paper consists of **FIVE** questions

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

Marks are indicated for each part of the question

This paper consists of **FOUR** printed pages

Question 1

- a) Using Macaulay's method, determine in terms of EI the deflection at points C and D in the beam loaded as shown in fig. 1.0 (14 marks)

Fig 1.0

- b) Show that the maximum shearing stress in a rectangular beam section is given by $\frac{1.5Q}{bd}$.

Where:

Q = maximum shear force

b = breadth of section

d = depth of section

(7 marks)

- c) Describe the pretensioning method of prestressed concrete (9 marks)

Question 2

- a) Fig 2 shows the plan and section through a precast concrete floor. The floor carries an imposed load of 3Kn/m^2 and the floor finish is 50mm screed of density 2000kg/m^3 . Design the beams for 1:2:4 concrete mix if $p_{sv} = 140 \text{ x/mm}^2$ and $m = 15$ (17 marks)

Fig 2.0

- b) Sketch an elevation and section of the beam in (a) to show the reinforcement details.

Question 3

Using the **THREE** moment theorem analyse the beam shown in fig 3.0 and hence draw the shear force and bending moment diagram indicating all critical values. (20 marks)

Fig 3.0

Question 4

A masonry dam of trapezoidal section has a vertical face whose height is 12m, while the base is 8m wide and the top 2.4m wide. The maximum water level allowed is 1.5m. below the top of dam. Examine the stability conditions of the dam with regard to:

- a) Tension in the joints
- b) Ground bearing pressure
- c) Factor of safety against overturning
- d) Factor of safety against sliding, taking the coefficient of friction between the base and foundation as 0.48. Take density of masonry as 2100 kg/m^3 and maximum allowable ground bearing pressure as 300 KN/m^2 (20 marks)

Question 5

- a) A cantilever ABC is fixed at A and propped at C is loaded as shown in fig 4. Find the reactions at C. (10 marks)

Fig 4.0

- b) A column is made up of two channels, ISJC 200 and two 250mm x 10mm flange plates as shown in fig 5.

Determine by Rankine's formula the safe load the column of 6m length, with both ends fixed, can carry with a factor of safety 4. The properties of one channel are:
Area = 77mm², I_{xx} = 11.612 x 10⁶ mm⁴ and I_{yy} = 0.842 x 10⁶ mm⁴. Distance of the centroid from back to web = 19.7 mm.

$$\frac{1}{7500}$$

O_c = 320 MPQ and Rankine's constant
Take

Fig 5.0

