



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

INSTITUTIONAL BASED PROGRAMME

BACHELOR OF ENGINEERING IN BUILDING & CIVIL ENGINEERING

EBC 4303: REINFORCED CONCRETE DESIGN

SERIES NOVEMBER 2011

TIME 2 HOURS

INSTRUCTION TO CANDIDATES

You should have the following for this examination

- Answer Booklet
- Scientific Calculator

This paper consists of FIVE questions, question ONE is compulsory,
Answer question ONE and any other TWO question
Maximum marks for each part of a question are as shown.

Question 1

- a) (i) What is the aim of Limit State design
- (ii) Briefly explain ultimate limit state and state the criteria that should be complied with for it.
- (iii) State any **FOUR** serviceability limit states and mention how each would make the structure unfit for use. (8 marks)
- b) State the reasons for the following being greater than anticipated in Limit state design
- (i) Material Strength
- (ii) Load (3 marks)

- c) State the purposes of the safety factor for
 (i) Load
 (ii) Strength (4 marks)
- d) Define characteristic strength (5 marks)

Question 2

- a) A five-storey building of the cross-section shown in figure 1. Has the following characteristic loads on the frame.

Roof:	
Dead Load	24KN/m
Imposed Load	8KN/m
Parapet Point Load	14KN

Floors:	
Dead Load	20KN/m
Imposed Load	25KN/m
Cladding-point Load	16KN/m

Fig 1.

- Determine the maximum ultimate design load for the left-hand column (12 marks)
- b) (i) Explain the two methods of manufacturing prestressed concrete.
 (ii) State the advantages and disadvantages of prestressed concrete (8 marks)

Question 3

A reinforced concrete floor slab spans between two 200mm thick solid concrete block walls distance 4.5m centre to centre apart. If the floor is subjected to an imposed load of 3.5KN/m² design the main reinforcement to be provided for the slab.

Assume mild exposure conditions and the following material strength properties:-

$F_{cu} = 35\text{N/mm}^2$ $f_y = 460\text{N/mm}^2$ (20 marks)

Question 4

A 350mm square internal column of 4.5m clear height supports characteristic dead and imposed loads of 1,00kN each. The column is in a braced two storey building and the load is transmitted to it through an approximately symmetrical arrangement of beams size 350mm wide x 600mm deep.

Design the longitudinal reinforcement and links for the column given that: $f_c = 30\text{N/mm}^2$, $f_y = 460\text{N/mm}^2$ (20 marks)

Question 5

A reinforced concrete beam spans 6.0m between the centres of supporting columns size 300 x 300mm. The beam is of cross-sectional size 300mm wide by 600 mm deep and it carries dead and imposed loads of 25 and 19kN/m respectively. Assuming mild exposure condition design the main reinforcement for the beam given the following material strength properties.

$f_{cu} = 30\text{N/mm}^2$, $f_y = 460\text{N/mm}^2$ (20 marks)