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 2HOURS

INSTRUCTION TO CANDIDATES

You should have the following for this examination
- *Answer Booklet*
- *Scientific Calculator*

This paper consists of <u>FIVE</u> questions, question <u>ONE</u> is compulsory,
Answer question <u>ONE</u> and any other <u>TWO</u> 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)

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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 $3.5KN/m^2$ design the main reinforcement to be provided for the slab.

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

$F_{cu} = 35N/mm^2$ $f_y = 460N/mm^2$ (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   (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.

Fcu = 30N/mm^2,   fy = 460N/mm^2 (20 marks)