



MACHAKOS UNIVERSITY

University Examination 2019/2020

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

BCECD 304: REINFORCED CONCRETE & MASONRY DESIGN

DATE: 5/12/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS

- This paper consists of **Five** questions.
- Answer question **ONE** and any other **TWO** questions
- Maximum marks for each part of the question are as shown.

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) A simply supported beam of 4.5m effective span carries a characteristic uniformly distributed dead load of 10kN/m inclusive of self weight. Design the beam for bending and shear given the following data:

$f_{cu}=25\text{N/mm}^2$; $f_y=460\text{N/mm}^2$; $f_{yv}=250\text{N/mm}^2$; fire resistance =1.5hrs (20 marks)

- b) Design a rectangular reinforced concrete column of effective length 3.6m to carry an axial characteristic dead load of 800kN.

$f_{cu}=30\text{N/mm}^2$; $f_y=460\text{N/mm}^2$; $f_{yv}=250\text{N/mm}^2$; fire resistance =1.5hrs (10 marks)

QUESTION TWO (20 MARKS)

A simply supported suspended floor slab covers a room with internal dimensions of 3m X 4m and is supported on 200mm thick masonry walls.

- a) Design the slab given the following characteristic loads and data:

Live load = 2kN/m^2 ; dead load = 2kN/m^2 ; finishes = 0.5kN/m^2 ; $f_{cu}=25\text{N/mm}^2$; $f_y=460\text{N/mm}^2$
fire resistance = 1.5hrs

- b) Sketch a plan showing the layout of the reinforcement. (20 marks)

QUESTION THREE (20 MARKS)

A reinforced concrete column of effective length 4.0m is required to transmit a factored axial load of 1000kN.

- a) Design a square column (8 marks)
b) Design a square base for the column (12 marks)

Design data:

$f_{cu}=30\text{N/mm}^2$; $f_y=460\text{N/mm}^2$; $f_{yv}=250\text{N/mm}^2$; fire resistance = 1.5hrs; Allowable soil bearing capacity = 250kN/m^2

QUESTION FOUR (20 MARKS)

Figure 1 shows a continuous floor slab consisting of solid slabs and beams with effective spans as shown.

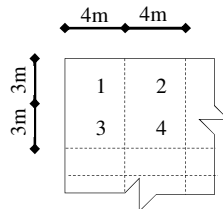


Fig. 1

- a) Design the panel labelled 3 given the following data:

Live load = 2.5kN/m^2 ; dead load = 1.5kN/m^2 ; $f_{cu}=20\text{N/mm}^2$; $f_y=460\text{N/mm}^2$; fire resistance = 1.5hrs

- b) Sketch the plan showing the layout of the reinforcement.

QUESTION FIVE (20 MARKS)

A simply supported beam of effective span 3.6m carries two characteristic dead point loads of 10kN each, located 1.2m and 2.4m respectively from the left end support.

Design the rectangular beam for bending and shear.

$f_{cu}=20\text{N/mm}^2$; $f_y=460\text{N/mm}^2$; $f_{yv}=250\text{N/mm}^2$; fire resistance = 1.5hrs