



MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR FIRST TERM EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

2707 203 / S: STRUCTURES II

DATE: 3/6/2021

TIME: 8:30 -11:30 AM

INSTRUCTIONS:

- This paper consists of **Five** questions.
- Answer all questions
- Maximum marks for each part of the question are as shown.

1.

- a) Explain **THREE** philosophies used in the design of reinforced concrete structures. (6 marks)
- b) 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 (14 marks)

2.

- a) Distinguish between ultimate and serviceability limit states, giving two examples in each case. (6 marks)
- b) A simply supported beam of effective span 4.0m carries a characteristic dead point load of 4kN located 1.8m from the left end support.
Design a rectangular beam for bending and shear.
 $f_{cu}=25\text{N/mm}^2$; $f_y=460\text{N/mm}^2$; $f_{yv}=250\text{N/mm}^2$; fire resistance = 1.5hrs (14 marks)

3.

- a) With the aid of labelled sketches, explain two forms of shear failure in beams. (8 marks)
- b) 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 (12 marks)

4.

- a) Distinguish between dead and imposed loads as used in design of structures, giving two examples in each case. (6 marks)

- b) A simply supported beam of overall span 4.0m carries a factored point load of 10kN located at mid span.

Design a rectangular beam for bending and shear.

$f_{cu}=25\text{N/mm}^2$; $f_y=460\text{N/mm}^2$; $f_{yv}=250\text{N/mm}^2$; fire resistance = 1.5hrs: bearing = 200mm (14 marks)

5.

- a) Illustrate *TWO* methods of providing shear reinforcement in beams.

(6 marks)

- b) A simply supported beam of effective span 4.2m carries a uniformly distributed characteristic dead load of 2kN/m and characteristic imposed load of 1.5kN/m along the entire span.

Determine the dimensions of the section and area of steel reinforcement.

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

(14 marks)