



MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY ORDINARY EXAMINATION

2017/2018 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATION

SEB 1343 –STRUCTURES IV

DURATION: 2 HOURS

DATE: TUE 17-04-2018

TIME: 2:00-4:00 PM

Instructions to Candidates:

1. Answer **Question 1** and **Any Other Two** questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

QUESTION ONE (30 MARKS)

- a). Define the following terms as used in concrete design:
- i. Design strength
 - ii. Characteristic strength
 - iii. Factor of safety (3 marks)
- b) Explain **two** limiting states requirements considered in design of reinforced concrete (4 marks)
- c). Explain any **four** serviceability limit states considered in the reinforced concrete design (8 marks)
- d). Explain the following terms as used in the reinforced concrete design:
- i. Under reinforced section
 - ii. Over reinforced section
 - iii. Balanced section (9 marks)
- e). Explain the term moment of resistance (6 marks)

QUESTION TWO (20 MARKS)

A simply supported beam carries a uniformly distributed load of 25KN/m over the whole span; it also carries a point load of 30KN at the centre, the effective length of the beam is 3.5m. Design the beam given the following:

$$\begin{aligned}P_{st} &= 210\text{N/mm}^2, \\P_{cb} &= 7\text{N/mm}^2, \\m &= 15 \\S/D &= 20\end{aligned}$$

(20 marks)

QUESTION THREE (20 MARKS)

A rectangular concrete slab measures 3.5m by 4m internally. It is supported on 200mm wall on all sides and carries a load of 3.6KN/m². Design the slab given the following:

$$\begin{aligned}P_{st} &= 210\text{N/mm}^2, \\P_{cb} &= 7\text{N/mm}^2, \\m &= 15\end{aligned}$$

(20 marks)

QUESTION FOUR (20 MARKS)

A reinforced short reinforced concrete column carries an axial load of 80kN and has an effective height of 5m. Design the column and its base given the following:

$$\begin{aligned}\text{Load bearing capacity of the soil} &= 250 \text{ kN/m}^2 \\ P_{st} &= 210 \text{ N/mm}^2, \\ P_{cb} &= 7 \text{ N/mm}^2, \\ P_{cc} &= 5.3 \text{ N/mm}^2, \\ P_{sc} &= 125 \text{ N/mm}^2, \\ m &= 15\end{aligned}$$

(20 marks)

QUESTION FIVE (20 MARKS)

A rectangular beam is supported on a column 300mm x 300mm and 4.5m apart, it carries a load from timber of 20kN/m. Design the beam given that:

$$\begin{aligned}\text{Characteristic material strength } f_n &= 30 \text{ N/mm}^2 \text{ and } f_y = 460 \text{ N/mm}^2 \\ \text{Effective depth} &= 550 \text{ mm} \\ \text{Breadth} &= 300 \text{ mm}\end{aligned}$$

(20 marks)