



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
**UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
(BSCE)**

ECE 2502: STRUCTURED DESIGN III

**END OF SEMESTER EXAMINATION
SERIES: AUGUST 2014
TIME ALLOWED: 2 HOURS**

Instructions to Candidates:

You should have the following for this examination

- Answer booklet
- Design codes, design tables and design charts

This paper consists of **FIVE** questions.

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

All questions carry equal marks

Maximum marks for each part of a question are as shown

This paper consists of **TWO** printed pages

Question One (COMPULSORY)

A typical reinforced concrete pad footing is required to resist characteristic loads of 1050KN dead and 300KN imposed from a 400mm square reinforced concrete column. The safe bearing capacity of the soil is 170KN/m² and the characteristic strengths of concrete and steel reinforcement are 35N/mm² and 500N/mm² respectively. Design a suitable reinforced concrete pad footing. Take cover to reinforcement as

50mm. Assume any other information that you may need and state it clearly. Detail the pad footing. **(30 marks)**

Question Two

Figure 2 shows the plan and elevation of a reinforced concrete pier. The loads indicated are design loads at the ultimate limit state (i.e they are factored loads). Design the required reinforcement for the pier at the ultimate limit state if the characteristic strengths of concrete and steel reinforcement are 40N/mm^2 and 460N/mm^2 respectively. Take cover to reinforcement as 40mm. 40mm. The articulation of the deck is such that:

- (i) No side-sway is allowed
- (ii) Side-sway is allowed

Comment on the results from the two cases. **(20 marks)**

Question Three

- a) Outline the various aspects considered in the design of timber elements subjected to bending. **(5 marks)**
- b) Select a suitable single timber beam in SC3 for the timber roof shown in figure 3(b) spanning between C2 and C3. Wane is likely to be found in the timber beam and is rests on 150mm thick wall plates. Assume any other information that you may require and state it clearly. **(15 marks)**

Question Four

- a) State the justification for the inspection and maintenance of bridge structures. Outline the various inspections carried out on bridge structures and state their objectives. **(8 marks)**
- b) Figure 4(b) shows a pile cap supported on four piles. The pile cap supports a bridge pier carrying an ultimate load (ie factored load) of 5000KN. Design the reinforcement for the pile cap. Information given:
 - Strength of reinforcement, f_y = 460N/mm^2
 - Strength of concrete, f_{cu} = 40N/mm^2
 - Cover to reinforcement, c = 100mm
 - Assume any other information that you may require and state it clearly. **(12 marks)**

Question Five

For the eight-storey building whose plan is shown in figure Q5, determine the stability ties required. Information given:

- Clear storey height under beams = 2.90m
- Floor to ceiling height = 3.40m
- Characteristic load (dead) = 5KN/m^2
- Characteristic load (imposed) = 3KN/m^2
- Characteristic steel strength = 460N/mm^2
- Characteristic concrete strength = 30N/mm^2

Assume any other information that you may required and state it clearly. **(20 marks)**