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: STRUCTURAL DESIGN III

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions.
Answer question **ONE (COMPULSORY)** in section **A** and any other **TWO** questions from section **B**
Maximum marks for each part of a question are as shown
This paper consists of **TWO** printed pages

SECTION A

Question One (Compulsory)

Select suitable timber joists in SC2 for the roof shown in figure 1. Spanning between C2 and C3

Joists are spaced at 400mm c/c

T & G boarding and roof finish	=	0.10KN/m^2
Ceiling	=	0.20KN/m^2
Self weight of joists	=	0.13KN/m^2
Imposed roof load	=	1.50KN/m^2

Wave is likely to be found in the joists and they rest on 100mm thick wall plates. Assume any information that you may need for the design. **(30 marks)**

SECTION B (Attempt any TWO questions)

Question Two

Design the reinforced concrete slab on first floor level spanning between D – E as shown in figure 1.

Imposed load	=	$3.5KN/m^2$
Fire resistance	=	1 hour
Concrete strength	=	$35N/mm^2$
Steel reinforcement strength	=	$460N/mm^2$
Cover to reinforcement	=	20mm
Modification factor	=	1.4
Maximum aggregate size	=	20mm
Supports	=	150mm thick

Assume any information required. No detailing required. **(20 marks)**

Question Three

a) With the aid of clearly labeled sketches, show the various components of a bridge structure and state their functions. **(10 marks)**

b) Figure Q3 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 strength of reinforcement and concrete are $460N/mm^2$ and $40N/mm^2$ respectively. Assume that the articulation of the deck is such that side sway is prevented. **(10 marks)**

Question Four

A typical reinforced concrete pad footing is required to resist characteristic loads of 1000KN dead 350KN imposed from a 400mm square reinforced concrete column. The safe bearing capacity of the soil is $2000KN/m^2$ and the characteristic material strengths for concrete and reinforcement are $35N/mm^2$ and $460N/mm^2$ respectively. Design a suitable reinforced concrete footing. Take cover to reinforcement as 40mm. **(20 marks)**

Question Five

The cantilever wall as shown in figure Q5 in back filled with granular material having a unit weight of $19KN/m^3$ and an interval angle of friction of 30^o.

a) Determine the factors of safety against sliding and overturning

b) Design the wall reinforcement

Allowable soil bearing pressure	=	$120KN/m^2$
Coefficient of friction	=	0.4
Unit weight of reinforced concrete	=	$24KN/m^3$
Concrete strength	=	$35N/mm^2$
Steel strength	=	$460N/mm^2$
Cover to reinforcement	=	35mm

Assume any other necessary information. **(20 marks)**