



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF ENGINEERING AND TECHNOLOGY
UNIVERSITY EXAMINATIONS FOR THE DEGREE OF SCIENCE IN:
BUILDING CONSTRUCTION AND MANAGEMENT
3RD YEAR 1ST SEMESTER 2015/2016 ACADEMIC YEAR
CENTRE: MAIN CAMPUS

COURSE CODE: TCM 3311

COURSE TITLE: STRUCTURES I

EXAM VENUE: CR

STREAM: BSc IN CONSTRUCTION

DATE: 26/4/16

EXAM SESSION: 2.00 – 4.00 PM

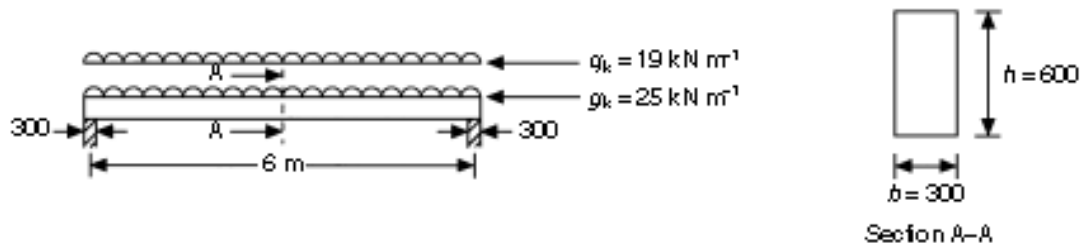
TIME: 2 HOURS

Instructions

- 1. Answer Question 1 (compulsory) and ANY other two questions**
- 2. Candidates are advised not to write on question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**

Question one

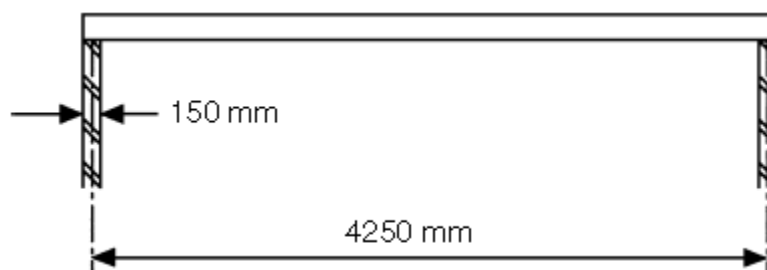
- Differentiate between design load and characteristic load. **(2mks)**
- Discuss how shear failure can arise in reinforced concrete members and how such failures can be avoided. **(4mks)**
- Explain the requirements of good detailing in reinforced concrete structures **(4mks)**
- A reinforced concrete beam which is 300 mm wide and 600 mm deep is required to span 6.0 m between the centres of supporting piers 300 mm wide. The beam carries dead and imposed loads of 25 kNm^{-1} and 19 kNm^{-1} respectively. Assuming $f_{cu} = 30 \text{ Nmm}^{-2}$, $f_y = f_{yv} = 500 \text{ Nmm}^{-2}$ and the exposure class is XC1, design the beam. **(8mks)**



- Differentiate between post-tensioning and pre-tensioning in prestressed concrete structures **(4mks)**
- List and discuss any five advantages of prestressed concrete **(5mks)**
- Explain the factors influencing deflection in prestressed concrete members **(3mks)**

Question two

- Differentiate between the ultimate and serviceability limit states. **(2mks)**
- A reinforced concrete floor subject to an imposed load of 6 kNm^{-2} spans between brick walls as shown below. Design the floor for exposure class XC1 assuming the following material strengths:
 $f_{cu} = 35 \text{ Nmm}^{-2}$
 $f_y = 500 \text{ Nmm}^{-2}$ **(10mks)**



- Sketch the reinforcement details for the designed floor **(3mks)**

Question three

- Explain how failure can occur in a concrete footing: **(3mks)**
- A 400 mm square column carries a dead load (G_k) of 1000 kN and imposed load (Q_k) of 350 kN. The safe bearing capacity of the soil is 200 kNm^{-2} . Design a square pad footing to resist the loads assuming the following material strengths:
 $f_{cu} = 30 \text{ Nmm}^{-2}$
 $f_y = 500 \text{ Nmm}^{-2}$ **(8mks)**
- Sketch the details of the reinforcement for the designed footing. **(4mks)**

Question four

- Discuss the different types of prestress losses that can occur in prestressed concrete members **(4mks)**
- A rectangular concrete beam of cross-section 30 cm deep and 20 cm wide is prestressed by means of 15 wires of 5mm diameter located 6.5 cm from the bottom of the beam and 3 wires of diameter of 5mm, 2.5 cm from the top. Assuming the prestress in the steel as 840 N/mm^2 , calculate the stresses at the extreme fibers of the mid-span section when the beam is supporting its own weight over a span of 6m. **(6mks)**
- If a uniformly distributed live load of 6 kN/m is imposed, evaluate the maximum working stress in concrete. The density of concrete is 24 kN/m^3 . **(4mks)**

