

 **MURANG’A UNIVERSITY OF 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**

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**COURSE CODE: TLM 3313**

**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**

1. Differentiate between design load and characteristic load.**(2mks)**
2. Discuss how shear failure can arise in reinforced concrete members and how such failures can be avoided.**(4mks)**
3. Explain the requirements of good detailing in reinforced concrete structures **(4mks)**
4. 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 Nmm−2, *f*y= *f*yv= 500 Nmm−2and the exposure class is XC1, design the beam.**(8mks)**



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

**Question two**

1. Differentiate between the ultimate and serviceability limit states**.(2mks)**
2. 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 Nmm−2

*f*y= 500 Nmm−2**(10mks)**



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

**Question three**

1. Explain how failure can occur in a concrete footing:**(3mks)**
2. 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 Nmm−2

*f*y= 500 Nmm−2**(8mks)**

1. Sketch the details of the reinforcement for the designed footing. **(4mks)**

**Question four**

1. Discuss the different types of prestress losses that can occur in prestressed concrete members

**(4mks)**

1. 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/mm2, 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)**

1. If a uniformly distributed live load of 6kN/m is imposed, evaluate the maximum working stress in concrete. The density of concrete is 24kN/m3**.(4mks)**

