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**University Examinations 2015/2016**

SECOND YEAR SECOND SEMESTER EXAMINATION

FOR DIPLOMA IN

CIVIL ENGINEERING

**ECV 2250: THEORY OF STRUCTURES III**

 **DATE: APRIL 2016 TIME: 1 ½ HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Explain the difference between a one way spanning slab and a two way spanning slab. (2 marks)
2. Illustrate three types of reinforced beams by cross-section. (6 marks)
3. A continuous one-away spanning slab has three equal spans of 3.5m each. The slab depth is assumed to be 140mm. The loading is as indicated below

Imposed loads = 3.0kNm-2

Dead loads = 5.2 kNm-2

Constants: fcv = 30Nmm-2

 Fy = 460 Nmm-2

Given that the exposure conditions are mild, and cover requirement is 25mm.

Design the slab and draw a sketch of the reinforcement distribution (8 marks)

1. By quoting compressive and tensile strength of materials, explain why concrete requires reinforcement (4 marks)
2. Give the purpose of these three elements of a simple structures (6 marks)
3. Columns
4. Beams
5. Slabs
6. State four factors which will affect the strength of reinforced concrete structures.

(4 marks)

**QUESTION TWO (15 MARKS)**

1. By use of clear sketches with good lables, explain the three types of beams by cross-section. (6 marks)
2. A reinforced concrete beam has an effective span of 9m, and carries a uniformly distributed dead and imposed loads as shown below

Qk=5kNm-1 fcv = 30Nmm-2

Gk = 4kNm-1 fy =500Nmm-2

Assuming a cross section of 200mm width by a depth of 370mm, design the bending reinforcement for the beam. (7 marks)

1. State two factors which affect the durability of concrete structures. (2 marks)

**QUESTION THREE (15 MARKS)**

1. State and explain at least two end conditions of columns for the purpose of design (4 marks)
2. Give three types of columns in terms of their dimensions and support. (3 marks)
3. Determine suitable dimensions for the effective depth and width of the beam, with the loading shown below. The effective span of the bema is 9m.

Qk = 25kN/m

Gk = 30kN/m

**QUESTION FOUR (15 MARKS)**

1. Calculate the self weight of a reinforced concrete beam of breadth 300mm and depth 650mm and length of 6m. Assume density of concrete to be 2400 kg/m3 (4 marks)
2. Differentiate between the design strength and the characteristic strength of materials as used in design (2 marks)
3. A short braced column carries load as shown below

Gk = 1000KN fy =500Nmm-2

Qk = 1000 KN fcv = 40Nmm-2

Design the longitudinal and links for the column given that the cross-sections 350mm square. (9 marks)