NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF THE BUILT ENVIRONMENT

DEPARTMENT OF ARCHITECTURE
BACHELOR OF ARCHITECTURAL STUDIES (HONOURS) DEGREE
2012-13 ACADEMIC YEAR
PART II – 1ST SEMESTER EXAMINATION – JANUARY 2013
AAR 2105 – STRUCTURAL DESIGN I

Instructions   *Duration: 3 Hours*

Answer all questions.   *Total Marks 100*

QUESTION 1

1.0 What are "characteristic loads ".   [5]

2.0 Define partial safety factors and describe why they are used in design.   [5]

3.0 What are the partial safety factors for dead and live loads.   [5]

4.0 Explain the difference between characteristic loads and design loads.   [5]

5.0 Explain the difference between Ultimate Moment of Resistance and Design Moment. [5]

[25]

QUESTION 2

(a) Calculate the self weight of the following

   (i)   a RC slab 175mm thick

  (ii)   a RC beam 500 x 230

  (iii)   a RC column 450x450 and 3.5m long

  The density of concrete is 2400kg/m^3

[12]

(b) A 3m high reinforced concrete column supports a 700kN characteristic dead load and a

  300kN characteristic imposed load. Calculate the total ultimate design load for the column

  if it is 300mm x 300mm in cross section and the density of concrete is 24kN/m^3

[13].

QUESTION 3

  A simply supported rectangular beam of 5.5m span carries a characteristic dead load, including self weight, g_k, and imposed load, q_k, of 15kN/m and 10kN/m respectively. The beam dimensions are breadth, b, 250mm and effective depth, d, 450mm

Calculate the area of reinforcement required.

Assume Grade 30 concrete and Grade 460 reinforcement

[25]

QUESTION FOUR

A series of steel beams spaced at 5m centers and spanning 7.5m support a 175mm thick reinforced concrete slab. If the characteristic live load is 3 kN/m² and the load induced by the weight of concrete is 24kN/m³, calculate the total uniformly distributed load (UDL) carried by the slab and beam.

[25]