NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF ARCHITECTURE AND QUANTITY SURVEYING
BACHELOR OF ARCHITECTURE (HONOURS) DEGREE
PART II SECOND SEMESTER EXAMINATIONS – MAY 2005
STRUCTURAL DESIGN II – AAR 2205

Instructions:
Answer all questions.

Total marks: 100
Time: 3 Hours

QUESTION 1

A reinforced concrete beam is required to span 6.50 m between the centers of supporting brick piers which are 300 mm wide. The beam carries a 1.75 m height of brickwork which consists of 2 No. 100 mm skins with a 50 mm cavity between them. The beam is to be designed for mild conditions of exposure.
Take f_{cu} = 40 N/mm^2, f_y = 460 N/mm^2 (for main reinforcement) and f_y = 250 N/mm^2 (for the links) (30 marks)
Design and detail the beam

QUESTION 2

A simply supported reinforced concrete slab 4 m long carries the following loads:
imposed = 2.50 kN/m^2
finishes and partition = 1.75kN/m^2
The characteristic material strength are: f_{cu} = 35 kN/mm^2 and f_y = 460 kN/mm^2
Design the slab (25 marks)

QUESTION 3

a) The stairs are of the type shown in Fig. Q3 spans longitudinally and set into the pockets in the two supporting beams. The effective span is 3 m and the rise of the stairs is 1.5 m, with 260 mm treads and 150 mm risers. The live load is 3.0 kN/m2, and the characteristic material strengths are f_{cu} = 30 kN/mm^2 and fy = 250 kN/mm^2 (20 marks)

QUESTION 4

A 250 mm square reinforced column with an effective length of 3 m contains four 25 mm diameter longitudinal bars. Calculate the safe axial load for the column if the permissible stress in the concrete = 5.3 N/mm2 and steel = 125 N/mm2. If the column is designed as a square containing 8.0 % of steel for the calculated safe axial load, what is the required size of the column? (25 marks)

Fig. Q3