

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF ARCHITECTURE AND QUANTITY SURVEYING

DEPARTMENT OF ARCHITECTURE
BACHELOR OF ARCHITECTURAL STUDIES (HONOURS) DEGREE

PART II - SUPPLEMENTARY EXAMINATIONS - JULY 2005
AAR – 2205 STRUCTURAL DESIGN II

Instructions

Time: 3 Hours

Answer All Questions
Total Marks

QUESTION 1

A reinforced concrete staircase shown in Fig.Q1 is to carry the following loads:

Imposed: 3 kN/m^2

Finishes and partitions = 2.1 kN/m^2

Take $f_{cu} = 40 \text{ N/mm}^2$, $f_y = 460 \text{ N/mm}^2$ and conditions of exposure are mild

Design and detail the staircase (30 marks)

QUESTION 2

A simply supported reinforced concrete slab 4 m long carries the following loads:

imposed = 2.50 kN/m^2

finishes and partition = 1.75 kN/m^2

The characteristic material strength are: $f_{cu} = 35 \text{ kN/mm}^2$ and $f_y = 460 \text{ kN/mm}^2$

Design the slab (25 marks)

QUESTION 3

Determine the ultimate moment of resistance of a T-section of the following dimensions:

$bf = 450 \text{ mm}$, $bw = 300 \text{ mm}$, $hf = 150 \text{ mm}$ and $d = 440 \text{ mm}$. The area of tension reinforcement = 2410 mm^2

The characteristic material strengths are $f_{cu} = 30 \text{ kN/mm}^2$ and $f_y = 460 \text{ kN/mm}^2$
(20 marks)

QUESTION 4

A reinforced concrete column has cross-sectional dimensions of 600 mm x 450 mm and is part of a braced frame. The effective height of the column in relation to both axes is 7.250 m. Design the column for the following conditions

i) axial load = 3500 kN, M_y (bottom) = 110 kNm, M_y (top) = 175 kNm

ii) conditions of exposure are mild

iii) $f_{cu} = 40 \text{ kN/mm}^2$ and $f_y = 460 \text{ kN/mm}^2$ (25 marks)

Fig. Q1