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 2006
AAR 2105 – STRUCTURAL DESIGN I

Instructions ***Time : 3 Hours***
Answer any FOUR questions

Question 1

(a) Discuss briefly the design process. [10]

(b) Draw a shear force and BM diagram for the beam loaded as shown in fig.1 below indicating all important values. [15]

Figure 1

Question 2

(a) State the principle of II axis. [5]

(b) Calculate the I*xx* and I*yy* of figure 2 below.

Figure 2

Question 3

(a) The section of floor in figure 3 is to be carried by 125 mm x 75 mm timber joists spanning the 3m length. The bending stress must not exceed 4,6 N/mm^2 and the total inclusive load per m^2 of floor is estimated to be 2kN. At what cross centre *x* in mm must timber beams be fixed. [25]

Figure 3

Question 4

A composite beam is formed using a 400 mm x 180 mm timber beam with a 300 mm x 12 mm steel plate securely fixed to each side as shown in fig 4. The maximum stresses in steel and timber respectively must not exceed 140 and 8 N/mm2 and the modular ratio is 20.

(a) What will be the actual stresses used for
  (i) the steel and
  (ii) the timber?

(b) What is the sate moment of resistance in Nmm for the beam section?

[25]

Figure 4

Question 4

Calculate the safe inclusive uniformly distributed load for a 475 x 152 UB 52 simply supported at its ends if,

a) the span is 6m
b) the span is 12m.

The maximum permissible bending stress is 165 N/mm^2 rand the maximum permissible deflection is 1/360 of the span. E = 205 000 N/mm^2. [25]