

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY  
DEPARTMENT OF CIVIL AND WATER ENGINEERING  
FACULTY OF INDUSTRIAL TECHNOLOGY  
BACHELOR OF ENGINEERING (HONOURS) DEGREE  
PART V FIRST SEMESTER EXAMINATION- DECEMBER 2005  
DESIGN OF STRUCTURES II – TCW 5102

**INSTRUCTIONS**

Answer Question ONE and THREE and any one of Question Two or Four  
Open Book Examination

Time: 4hours  
Total Marks:100

**QUESTION ONE**

Design an interior panel of flat slab of 6.5m x 5.5m with a drop panel of 3.25m x 2.75m and columns 500mm square. The total thickness of the drop panel to be overall slab thickness plus 40mm.

Characteristic Dead load including self weight of slab = 8.0kN/m<sup>2</sup>

Characteristic Imposed load = 6.0kN/m<sup>2</sup>

Characteristic material strengths are  $f_c = 30 \text{ N/mm}^2$  and  $f_y = 460 \text{ N/mm}^2$

Design and detail one column and its foundation.  
Assume soil bearing pressure of 200 kN/m<sup>2</sup>

40 Marks

**QUESTION TWO**

Design a combined rectangular footing for two columns A and B .

Column A carries a load of  $G_k = 500 \text{ kN}$  and  $Q_k = 200 \text{ kN}$  and is 400mm square.

Column B carries a load of  $G_k = 1000 \text{ kN}$  and  $Q_k = 400 \text{ kN}$  and is 600mm square.

The columns are at 5.0m centers. The property line is 270mm beyond the face of column A.

Assume safe bearing capacity of soil as 150kN/m<sup>2</sup>.

Characteristic material strengths are  $f_{cu} = 40 \text{ N/mm}^2$  and  $f_y = 460 \text{ N/mm}^2$

20 Marks

**QUESTION THREE**

A roof Truss is shown in Figure 1.0.

Design the following members :

(a) Top Chord member

(b) Bottom Tie member

**(c) Internal members**

**The effect of wind loading is not to be considered and do not check deflection.**

**DIMENSIONS:**

**Span of Truss = 16.0m**  
**Rise of Truss = 3.2m**  
**Roof slope = 21.8deg**  
**Truss spacing = 4.0m**  
**Rafter length = 8.62m**

**LOADING:**

**cladding + insulation = 0.12 kN/ m<sup>2</sup>**  
**Live Load = 0.75 kN/m<sup>2</sup>**

**40Marks**

**QUESTION FOUR**

**Design the purlins for the roof truss in Question Three.**  
**Check only the shear capacity, moment capacity and deflection.**  
**Take Modulus of Elasticity  $E = 205\text{kN/mm}^2$**

**20 Marks**

