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- APRIL 2009
DESIGN OF STRUCTURES II – TCW 5102

INSTRUCTIONS

Answer All Questions **Time : 4 Hours**
Open Book Examination **Total Marks 100**

QUESTION ONE

A L-shaped flanged beam in a typical floor of a multistory building is continuous over many equal spans of 5000mm each. The slab is 175mm thick.
Design the beam and sketch the reinforcement details for the first interior support and mid-span of the end span. The design information is given below:

Characteristic dead load including self-weight	15.5kN/m
Characteristic imposed load	4.4kN/m
Concrete	Grade 30
Reinforcement	
Main reinforcement	Grade 460
Links	Grade 250

Table 3.5 Design ultimate bending moments and shear forces

	At outer support	Near middle of end span	At first interior support	At middle of interior spans	At interior support
Moment	0	0.09Fl	- 0.11Fl	0.07Fl	- 0.08Fl
Shear	0.45F		0.06F		0.55Fl

l - effective span F is total design ultimate load $(1.4G_k + 1.6Q_k)$

Marks 30

QUESTION TWO

Design a combined rectangular footing for the following:
An exterior column with the external face at the boundary line is 450mm square and carries an ultimate design load of 1350kN. The internal column is 450mm square and carries an ultimate design load of 2200kN. The columns are 6.5m center to center. Assume Grade 30 concrete and Grade 460 reinforcement. Assume safe soil bearing pressure of 200kN/$m^{2.}$. Sketch the reinforcement details.

Marks 40

QUESTION THREE

The maximum design compressive force in the top chord of a truss is 122kN and the maximum design tensile force in the bottom tie is 113kN. The length of the top chord is 8.62m and is divided into four equal panels.
Select a suitable unequal angle section composed of two unequal angles long legs back to back for the top chord and bottom tie in Grade 43 steel.

Marks 30