DEPARTMENT OF CIVIL ENGINEERING

MINOR I :CEL727 DESIGN OF INDUSTRIAL STRUCTURES
(2011-12)

Time allowed: 1hour   **Date** : 02 September 2011
Venue   : IV 323   **Max marks : 20**

NOTE: (a) This question paper contains two questions and one page only. (b) All questions are compulsory. (c) **Assume any data which you deem is necessary but not supplied. (d)** Draw neat and clear sketches wherever required.

Question 1.

Determine the minimum thickness of the concrete block (see Fig. 1) to support a reciprocating type machine such that the system is safe against resonance and the vibration amplitude is within the permissible limits. The machine weighs 500 kg and operates at a frequency of 50 Hz with a reciprocating mass of 1kg vibrating in the vertical plane at an amplitude of 250mm. There is no unbalanced mass vibrating horizontally.

The geotechnical report recommends a minimum depth of 500mm below the ground level. The soil has a coefficient of uniform elastic compression equal to 120×10^4 kN/m^3.
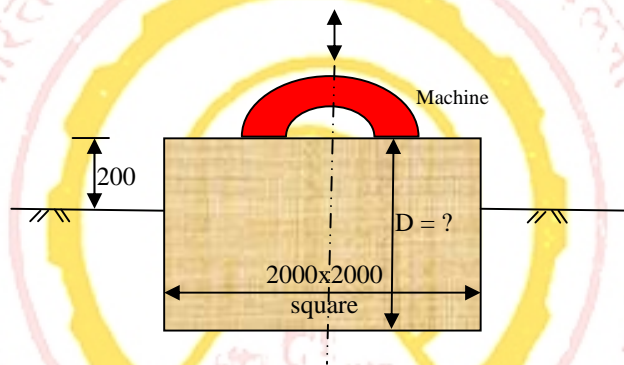
(**10 marks**)

Fig. 1 Foundation elevation for Question 1 (All dimensions in mm)

Question 2.

For the footing shown in Fig. 2, under the combination (Dead loads + Earthquake in x-direction), following forces are determined to act at the top of footing by analysis:

P = 975 kN, M_x = 270 kNm, M_y = 50 kNm, H_x = 20 kN, H_y = 5 kN

The designer has provided dimensions of L =3m and B =2m, with a thickness of 600mm. The foundation is positioned 2.5m below the ground level and water table starts 1m below the ground level. The allowable net bearing pressure 2.5 m below the ground level is 225 kN/m^2 .
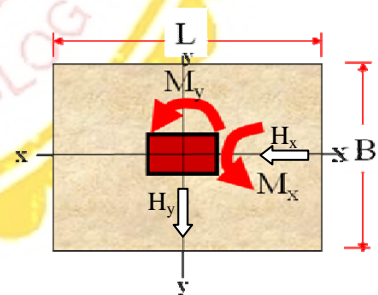

Fig. 2 Plan of foundation

For this footing check the following:

1. Adequacy of the chosen size from base pressure requirements.
2. Reinforcement necessary from 1-way shear consideration.
3. Safety against 2-way shear.

Assume M25 concrete and Fe 500 steel.

(4+3+3 =10 marks)