



DEPARTMENT OF CIVIL ENGINEERING

**MAJOR EXAM :CEL727 DESIGN OF INDUSTRIAL STRUCTURES
(2010-11)**

Time allowed: 2 hours
Venue : III 336

Date : 18 November 2010
Max marks : 40

NOTE: (a) This question paper contains four questions and two pages 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.

Q1. Check for the adequacy of the concrete block foundation shown in Fig. 1 (all dimensions are in mm) for a reciprocating type machine against resonance, vibration amplitude and soil bearing pressure. Following specifications are supplied by the manufacturer:

Unbalanced mass vibrating horizontally = 0.203kg
Associated maximum displacement = 100mm
Unbalanced mass in vertical direction = 0 kg
Operating frequency = 5 Hz

The machine weighs 200kg and its centre of gravity is located at a height of 200mm above the top of the foundation. The soil has a coefficient of uniform elastic compression equal to $50 \times 10^4 \text{ kN/m}^3$ and allowable bearing pressure of 300 kN/m^2 . The manufacturer has specified the maximum permissible amplitude of displacement equal to 0.3mm.

(18 marks)

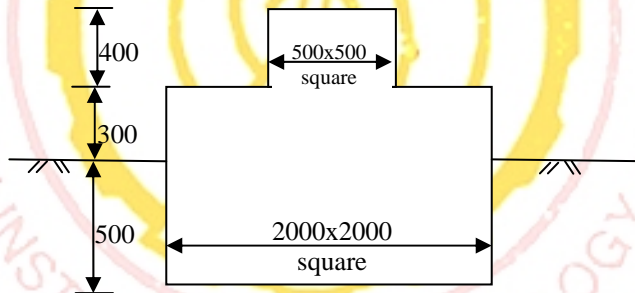


Fig. 1 Foundation elevation for Question 1 (All dimensions in mm)

Q2. In order to store a specific volume of a material, which will be more economical: bunkers or silos? Please elaborate.

(6 marks)

Q3.

- (a) Determine the horizontal reinforcement (diameter and spacing) at mid height for a reinforced concrete silo of mean diameter 3m and height 10.5m. Assume M25 concrete and Fe415 steel. The material stored has a density of 1500 kg/m^3 , angle of repose equal to 30° and coefficient of friction equal to 0.45.
- (b) At what depth measured from the top of the silo will the horizontal pressure equal to half of the maximum possible value.

(6+ 4 = 10 marks)

- Q4.** Compare the uplift force caused by wind force blowing normal to the ridge for a double sloping roof of 20° with that for a curved roof of same height on the basis of IS 875. Assume $h/w = 0.45$ and $H/l = 0.2$. Comment which is of the two shapes is more economical.

(6 marks)

