DEPARTMENT OF CIVIL ENGINEERING

MAJOR EXAM :CEL727 DESIGN OF INDUSTRIAL STRUCTURES (2012-13)

Time allowed: 2 hours   **Date** : 03 May 2013
Venue   : **V 216**   **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. List any four points which typically differentiate a pre-engineered building with a conventional building.

(4 marks)

Q2. Design the side wall of a circular bunker to store 30 tonnes of coal. The bunker has a mean diameter of 3m. Assume the density of coal as 900 kg/m^3 and angle of repose equal to 34°. Assume M40 concrete and Fe 415 steel.

Repeat the calculations if it is decided to adopt a square bunker of 2.66x2.66m plan dimensions.

(**5+5= 10 marks**)

Q3. For an isolated footing, under the combination **Dead loads + Earthquake**, following forces are determined to act at the top of footing by analysis:

$$P = 1200 \text{ kN}, M_x = 300 \text{ kNm}, M_y = 100 \text{ kNm}, H_x = 8 \text{ kN}, H_y = 25 \text{ kN}$$

The designer has provided dimensions of L =3m and B =2m, with a thickness of 600mm. For this footing check the safety against 2-way shear.

Assume M25 concrete and Fe 500 steel.

(6 marks)

Q4. Determine the horizontal reinforcement (diameter and spacing) at bottom for a reinforced concrete silo of mean diameter 2m and height 20m. Assume M25 concrete and Fe415 steel. The material stored has a density of 1200 kg/m^3, angle of repose equal to 30° and coefficient of friction equal to 0.35.

(6 marks)

Q5. A reinforced concrete chimney (grade M40) has a mean diameter of 750mm, wall thickness of 200mm and a height of 30m. It has a brick lining of 115mm inside. The temperature difference between outside and inside is 100°C. The vertical reinforcement is 1% provided on the outer surface with an effective cover of 50mm. Determine the following:

(i) Vertical stresses in concrete and steel due to temperature difference only.
(ii) Vertical stresses in concrete and steel due to combined effect of dead loads and temperature difference.
(iii) Determine the total wind load acting on the chimney, assuming rough surface, with projections of 20mm in length.

(5+6+3 = 14 marks)