



DEPARTMENT OF CIVIL ENGINEERING

MAJOR EXAM :CEL727 DESIGN OF INDUSTRIAL STRUCTURES (2013-14)

Time allowed: 2 hours

Venue : V 216

Date : 02 May 2014

Max marks : 40

NOTE: (a) This question paper contains seven 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.

Q1. Design the side wall of a rectangular bunker of plan size 3x5m and height 2m for **horizontal bending moment and tension** (only) at the corner and the midpoint of the longer wall. The bunker stores a granular material of density 1200 kg/m^3 and angle of repose equal to 30° . Assume M40 concrete and Fe 415 steel. Sketch the design details.

(8 marks)

Q2. Present any three points which you would like to highlight in making case for a pre-engineered steel building (shed type) against a conventional steel building with a span of 30m and height of 8m.

(3 marks)

Q3. Determine the vertical axial stress at the bottom of a circular RC silo of mean diameter 3m, height 30m and thickness 250mm. The material stored has a density of 900 kg/m^3 , angle of repose equal to 25° and coefficient of friction equal to 0.3.

(5 marks)

Q4. A reinforced concrete chimney (grade M40) has a mean diameter of 1m, wall thickness of 250mm and a height of 30m. It has a brick lining of 100mm inside. The temperature difference between outside and inside is 150°C . The vertical reinforcement is 1.5% provided on the outer surface with an effective cover of 60mm. Determine the following:

- Vertical stresses in concrete and steel due to temperature difference only.
- Vertical stresses in concrete and steel due to combined effect of dead loads and temperature difference.

(4+5 = 09 marks)

Q5. The base of a steel column in a shed type industrial building is under a tension of **60 kN** and a bending moment of **250 kN-m**. The designer has adopted ISMB 500 (of grade Fe 410 W conforming to IS 2062) for the column.

- Determine the height of the gusset plates necessary such that the fillet weld connection is adequate. Assume that f_u of the weld metal to be higher than that of the parent metal. Assume a weld size of 8mm and welding is performed in the field. Show the final design using a figure.
- Determine if 8mm all round field fillet weld at the base of the column is adequate (ignore the welds around gusset plates?)

(5+5=10 marks)

Q6. For a three storey RC structure in zone V, which would be more economical: OMRF or SMRF? Explain.

(2 marks)

Q7. Determine the mean probable design life of a structure in a region of basic wind speed 44m/s for which the risk factor is 0.96.

(3 marks)