PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech. Summer 2018– 19 Examination

Semester: 2   Date: 13/05/2019
Subject Code: 203209187   Time: 10:30 AM TO 1:00 PM
Subject Name: Design of Industrial Structures   Total Marks: 60

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 A) Draw a neat labelled sketch of a pitched roof portal frame showing its various components. **(05)**

B) Draw a neat sketch showing various loads to be considered in the design of a gantry girder. **(05)**

C) Write the specifications regarding the dimensioning of a self-supporting chimney according to IS-6533. **(05)**

Q.2 **Answer the following questions**. (Attempt any three) (Each five mark) **(15)**

A) Determine the moments and forces due to the vertical and horizontal loads acting on a simply-supported gantry girder given the following data:
1. Simply-supported span = 6 m
2. Crane's wheel centers = 3.6 m
3. Self-weight of the girder = 1.6 kN/m
4. Maximum crane wheel load (static) = 220 kN
5. Weight of crab/trolley = 60 kN
6. Maximum hook load = 200 kN

B) Calculate the longitudinal stresses on the hopper bottom for the circular silo to store cement, given the following data:
1. Vertical Pressure, P_v = 67.12 kN/m^2
2. Height of silo = 12 m
3. Height of hopper = 4 m
4. Slope of hopper = 2.285 in 1
5. Internal dia. of silo = 4 m
6. Bulk density of cement = 15.5 kN/m^3
7. Angle of internal friction = 25^0

C) List and sketch different profiles of cross sections which are used for gantry girders.

D) List down the different loads and load combinations to be considered for the analysis design of a chimney.

Q.3 A) Calculate the horizontal and vertical pressures at sections A, B, C & D as shown in the figure 1 below for a circular silo of 12 m height and 4 m internal diameter, to store cement of bulk density 15.5 kN/m^3. Angle of internal friction is 25^0. **(07)**
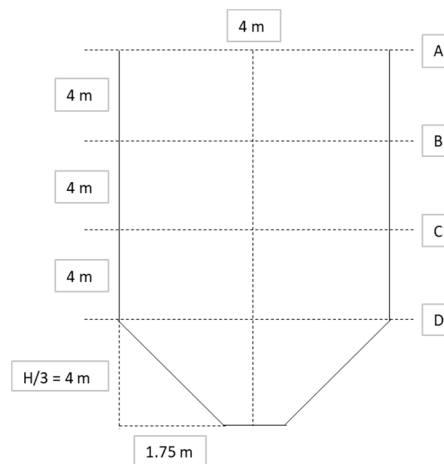
Figure 1

B) For the compound section for the gantry girder shown in the figure 2 below, calculate all the elastic and plastic properties. **(08)**
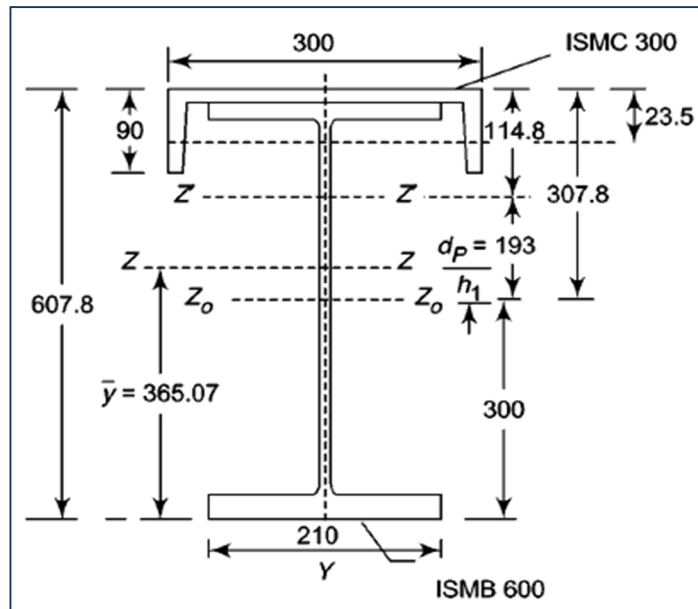
Figure 2

OR

B) For the compound section for the gantry girder shown in the figure 2 above, classify the type of section and calculate the elastic lateral buckling moment capacity. **(08)**

Q.4 A) For a self-height supporting chimney in Delhi, of height of 72 m above the foundation, carry out the design for sections X_1-X_1 and X_2-X_2 as shown in the figure 3 below, given the following data:

Diameter of the cylindrical part = 3 m

Soil type = Medium

SBC of soil = 200 kN/m²

Thickness of fire bricks for lining = 100 mm (the lining is supported throughout the height of the chimney)

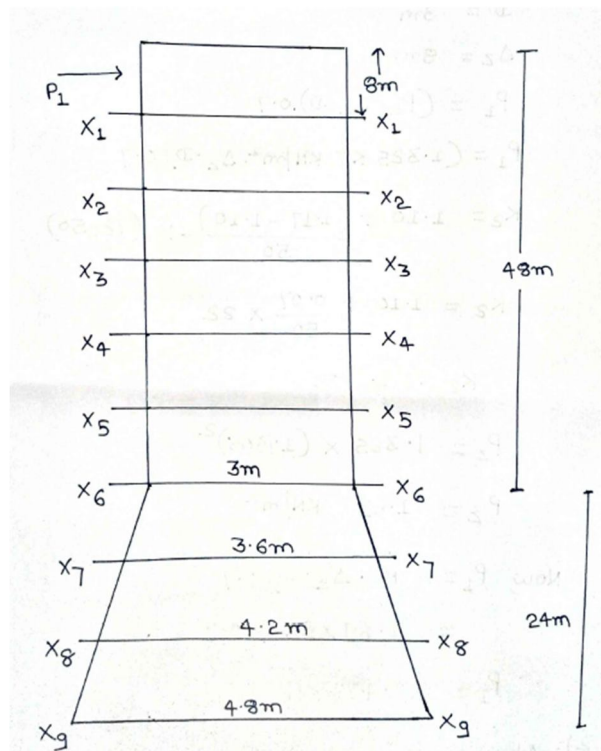Topography at site is flat & location of terrain category is 2 class C.

(07)

Figure 3

OR

A) A fixed-base portal frame is subject to a vertical load of 2P and a horizontal load of P as shown in figure 4. The length of the beam is 6L and of the column is 4L. Consider the plastic moment capacity **(07)**

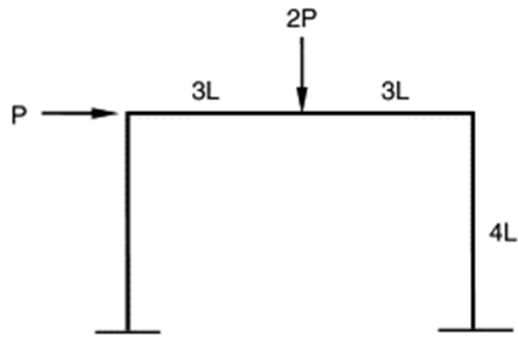of the beam and both the columns as Mp. Find the collapse load $P = P_w$.

Figure 4

B) Design an elevated cylindrical tank with conical bottom for 1,60,000 capacity. Tank has conical roof. Ring beam of the tank is at a height of 12 m from G.L. Tank is to be built at Mumbai. **(08)**