B. CONSTRUCTION ENGG. FINAL EXAMINATION, 2006

(1st Semester)

HIGHRISE AND INDUSTRIAL STRUCTURES

Time : Three hours Full Marks : 100

(50 marks for each part)

Use a separate answer-script for each part.

PART-I

Answer any *two* questions.

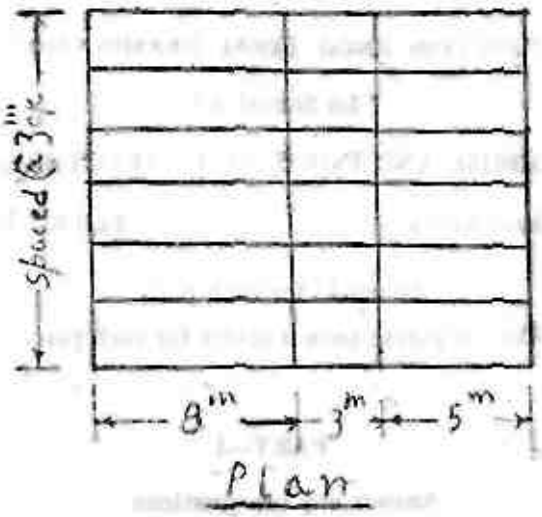
Figures in the margin indicate full marks.

Assume reasonable values of any data not provided.

1. The plan and elevation of a 8-storied R.C. framed residential building is shown in Fig.Q1. The spacing of the frames are at intervals of 3 m. Assuming the intensities of dead load and live load at an intermediate floor as 3·5 kN/m^2 and 5.0 kN/m^2 respectively, evaluate the design B-M.S. at midspan of AB and also at joints A and B of the frame as shown in the figure. The rotational stiffness of the members are as shown beside each member of the figure.

Also comment on the correctness of the approximate method of analysis adopted. 20 + 5

Figure Q1—see page 2.



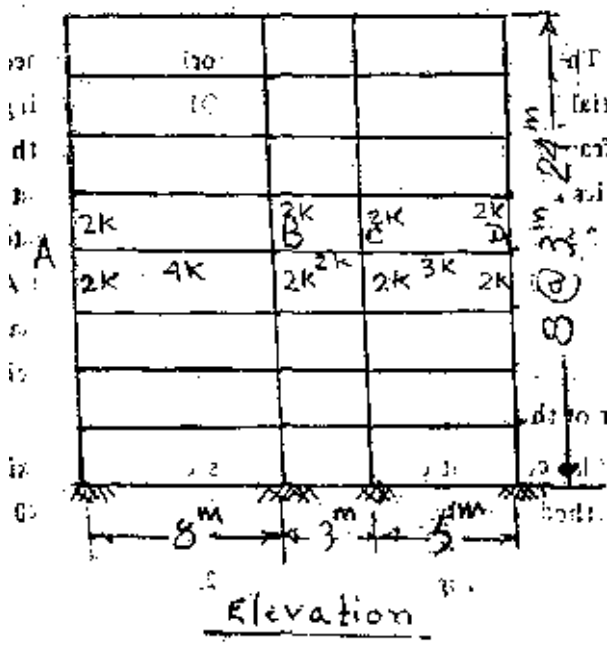


Fig. Q1

2. (a) How do lateral forces come to act on High rise structure ? How do you analyse them in evaluating forces and moments in the frame members ? Discuss only the cantilever method of analysis and comment on its merits and demerits.

(b) If, for the frame shown in Fig. Q. 1, the seismic force at roof level is 300 kN, calculate the axial forces, shear and B.M. in frame members at the roof level only. 10+15

3. (a) Distinguish between rectilinear and curvi-linear structures. Deduce the expressions for meridional and hoop forces in a spherical dome of semi- angle θ and radius R.

(b) A spherical dome has radius at base 10 m and rise 4 m. The self wt. of dome per unit surface area is 2·5 kN/m^2. Calculate the meridional and hoop forces per unit length at crown and also at supports at base. 15 + 10

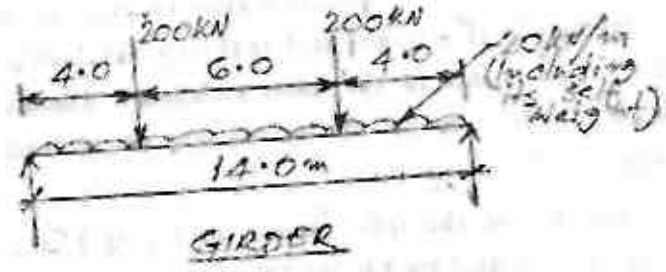
PART—II

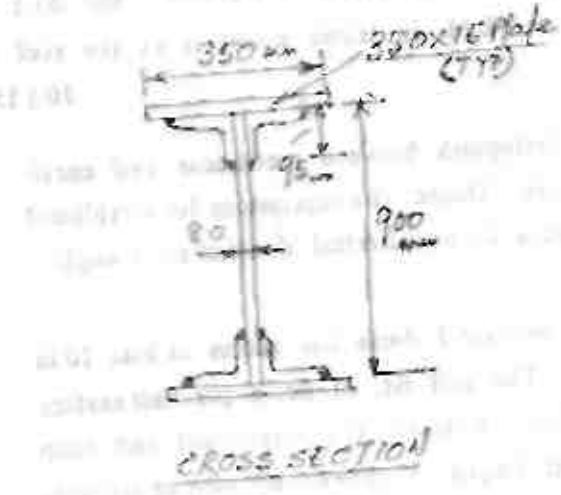
Answer any *three* questions.

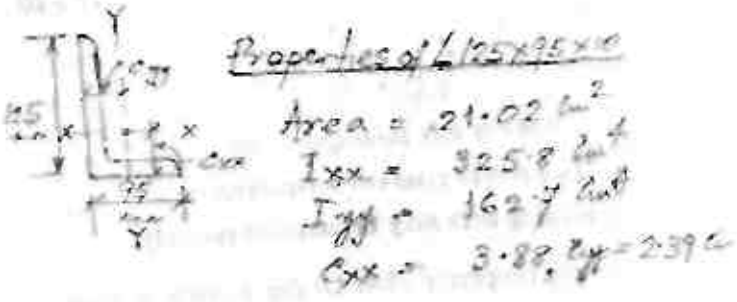
Two marks reserved for neatness.

Any missing data may be assumed suitably.

4. A simply supported plate Girder having a span of 14 m has to support floor beams with other loading details as shown below:







The top flange of the girder is restrained effectively and the girder is providedwith 2∠125×95×10 flange angles welded as shown. Assume the depth of web plate to be 900 mm.

Check the following :

(a) Adequacy of flange area provided

(b) The requirement of web stiffeners

(c) The maximum value of deflection to satisfy the requirement of Span/500.

Assume f_y — 250 N/mm^2.

The permissible bending stresses σ_{bc}/σ_{bt} = 165 N/mm^2.

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5. Answer any *four* of the following : 4 × 4

(a) Slag inclusion in welding.

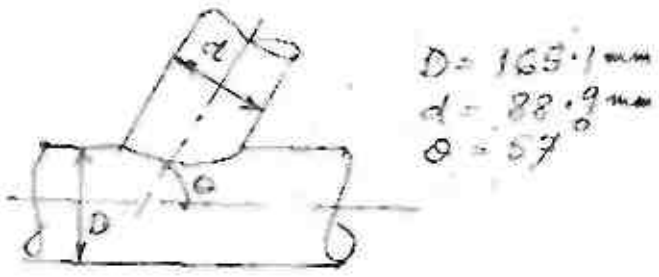
(b) Design consideration for a cable or pipe trench with an example of pipe trench.

(c) Draw sketches (2 no.) connecting tubes with gusset plates.

(d) Dimensional criteria for machine foundation design.

(e) Methods of design for steel framework.

(f) Calculate the length of the curve of inter-section when two tubes are connected using the following values :

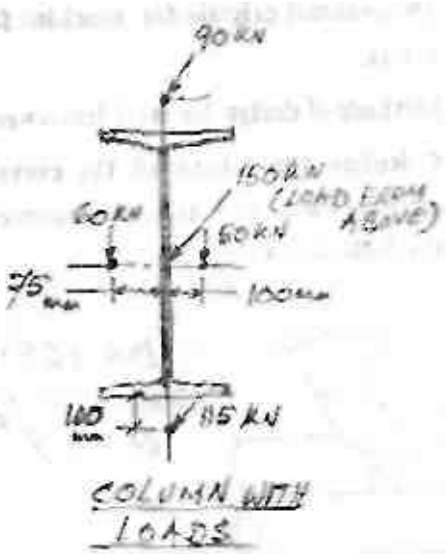


6. Answer any *two* questions : 8+8

(a) Calculate the value of plastic moment M_p and draw the plastic binge diagram for the beam shown below :

(b) Joints in Industrial floors with sketches.

(c) Check the adequacy of a Column Continuous between first and second floor of a building frame having load arrangement as shown below. The effective length of the column may be assumed as 2·8 m.



Try with ISMB-350 properties :

Area 'A' == 66·71 cm^2

γ_{xx} = 14·29 cm

γ_{yy}. = 2.84

Z_{xx}. = 778·9 cm^3

Z_{yy} = 76.8cm^3

Assume the following permissible stresses:

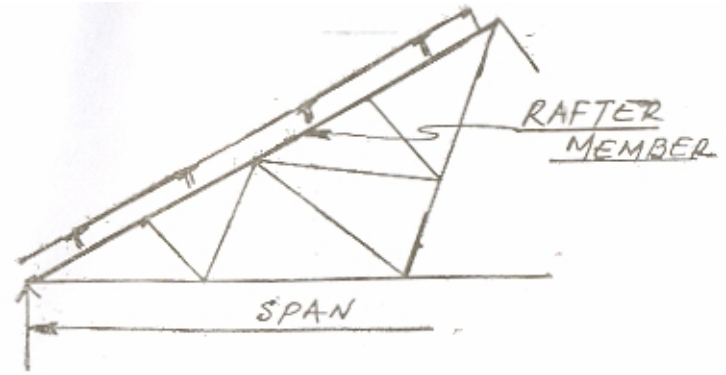
σ_{ac} = 82 N/mm^2

σ_{bcx} = 160 N/mm^2

σ_{cy} = 126 N/mm^2

C_m = 0·85

7. (a) Check the adequacy of the rafter member subjected to the loading of glazing purlins of a truss as shown below :



From the analysis, the rafter member is subjected to the following :

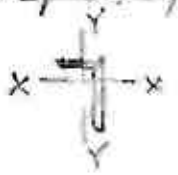
(i) Compressive member force = 88 kN

(ii) Maximum Bending Moment = – 1·75 kNm

(Hogging)

Try with 2 ∠,75×50×8 back to back and check the adequacy. 8

Properties of each L 75×50×8



$A_{xx} = 9.38\ cm^2$

$Z_{xx} = 10.4\ cm^3$

$Z_{yy} = 4.9\ cm^3$

(b) Bracing arrangement against lateral loads for an industrial shed. Assume a reasonable size of the shed and draw sketches. 8

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