B. Arch. Part -III, 6th Semester Examination, 2009

Subject: Structural Engineering - IV

Subject Code: CE 601A

Full Marks: 75 **Time: 3 hours**

Use separate answerscript for each half

The questions are of equal value.

Assume reasonable data, if required. All notations have their usual meanings.

FIRST HALF

(Answer any THREE questions)

(Two marks are reserved for neatness)

Q.1 (a) What are the advantages and disadvantages of prestressed concrete in comparison with reinforced concrete?

(b) Differentiate between pre-tensioning system and post-tensioning systems.

Q.2 (a) Mention some of the important applications of prestressed concrete.

(b) A beam of 200 mm (width)×400 mm (depth) is prestressed by a force of 300 kN by steel cables located at an eccentricity of 75 mm. Determine the loss of prestress due to creep of concrete for the following data.

$\sigma_{ck} = 45$ N/mm^2, Cables = 6 Nos of 7 mm, Creep coefficient (θ) = 2

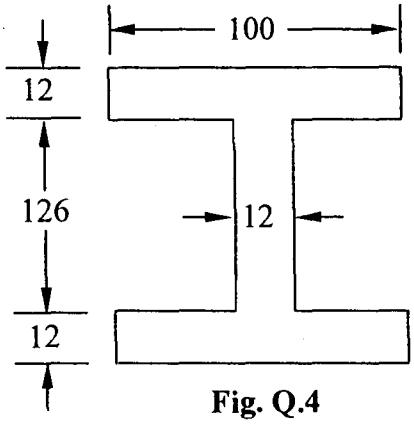
$E_s = 200$ kN/mm^2, $E_c = 4500\sqrt{\sigma_{ck}}$

Q.3 (a) State the assumptions in plastic theory.

(b) Derive the expression for moment of resistance of a rectangular beam section for a given depth of penetration.

Q.4 (a) A simply supported beam of rectangular section and span 'l' carries a concentrated load (W) at the centre, find at the stage of collapse and what part of the beam is fully elastic.

(b) Determine the shape factor for the beam section shown in Fig. Q.4. Find also the fully plastic moment of beam section. Take, $f_y = 250$ N/mm^2



* All dimensions are in mm

Fig. Q.4

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Q.5 (a) What are the different types of losses in prestressed concrete members? Explain in details.

(b) Define proportional limit, elastic limit, yield point and ultimate strength of steel with a neat sketch.

SECOND HALF

(Answer any THREE questions)

(Two marks are reserved for neatness)

Q.6 A multi-storeyed framed building with the following informations. Calculate the lateral force due to wind at each storey as per provisions given in IS: 875 (part-3), 1987.

(i)	Length of the building:	40 m
(ii)	Width of the building:	10 m
(iii)	Height of the building:	48 m
(iv)	Height of each storey:	4 m
(v)	Spacing of frames:	5 m (along the length/width)
(vi)	Topography:	Flat that is upwind slope < 3°
(vii)	Life of the Structure:	100 years [Risk factor (K_1 = 1.07)]
(viii)	Basic wind speed at 10 m height:	47 m/s
(ix)	Terrain category:	3
(x)	Force co-efficient (C_f):	0.65

Height (m)	K_2
10	0.88
15	0.94
20	0.98
30	1.03
50	1.09
100	1.17

Q.7 State the assumptions of portal method. Analysis the frame due to lateral load as shown in Fig. Q.7 using portal method.

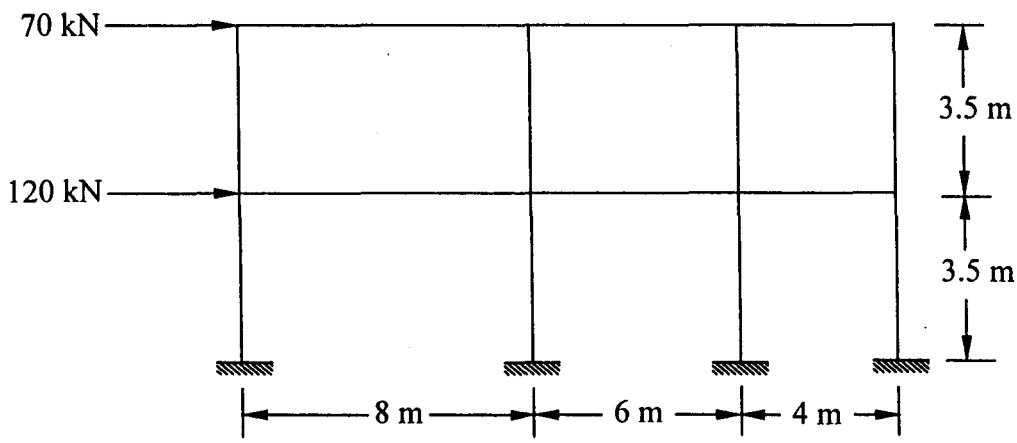

Fig. Q.7

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Q.8 (a) What are the different types of wind flow?

(b) Explain boundary layer depth with neat sketch.

(c) What are the different types of terrain category and class of structures as per provisions given in IS: 875 (part-3), 1987?

(d) State the evaluation procedure of wind load for an individual cladding member as per provisions given in IS: 875 (part-3), 1987.

Q.9 A circular section of radius 'r' is bent in the form shown in Fig. Q.9. It is fixed at 'A' and 'D'. It is loaded by a point load 'W' at the mid-point of the portion BC. Draw the bending moment and shear force diagrams and find the deflection at the mid point of BC. [Take G = 0.4E, J = 2I]

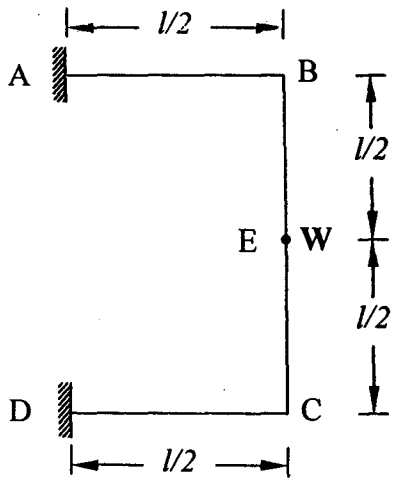

Fig. Q.9

Q.10 Derive the expressions for moment at the support and torsional moment at any point at an angle φ from the support of a circular beam loaded uniformly and supported on symmetrically placed columns.