Total No. of Questions : 8]

SEAT No. :

**P718**

[Total No. of Pages : 4

# [4659] - 3
# B.E. (Civil) (Semester - I)
## STRUCTURAL DESIGN - III
## (2008 Pattern)

*Time : 4 Hours]* *[Max. Marks : 100*

***Instructions to the candidates:***

1) ***Answer Two questions from Section I and Two questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Assume suitable data, if necessary.***
7) ***Use of IS 1343, IS 456, IS 3370 & non programmable calculator is allowed.***
8) ***More reproduction from IS code as answer, will not be given full credit.***

## SECTION - I

***Q1)*** a) Explain with sketch, why eccentric prestressing is preferable to concentric prestressing. **[8]**

b) A beam of unsymmetrical I-Section is used to support a live load of 10 kN/m over a span of 15 m. The beam is prestressed by a panabolic cable with an eccentricity of 150 mm at the centre and zero at the supports with an effective force of 1100 km. The I-Section has top flange 750 mm wide and 200 mm deep, bottom flange 400 mm wide and 300 mm deep and web 500 mm deep and 150 mm wide. Calculate extreme fiber stress in concrete at mid-span for the following condition : **[17]**

i) Prestress + Self weight.

ii) Prestress + Self weight + Live Load. Take mass of concrete as 25 kN/m$^3$. Assume 15% loss of prestressing.

***P.T.O.***



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OR

***Q2)*** a) What is load balancing concept? Explain with sketch. **[8]**

b) A post tensioned prestressed concrete beam of 16 m span is subjected to prestressing force by 5 Nos. of 12/5 Freyssinet parabolic cables with their C.G. at 130 mm from extreme bottom fiber, stressed one at a time from only one end at 800 MPa. Calculate total loss of prestress at the age of 90 days for the following data : Top flange 525 mm × 200 mm, bottom flange 350 mm × 250 mm and web 150 mm × 650 mm, Es = 210 GPa, Ec = 0.382 GPa, coefficient of friction = 0.25, Wobble correction factor = 0.0015 per meter, anchorage slip = 2.5, creep coefficient = 2.4. **[17]**

***Q3)*** Design a post tensioned prestressed concrete beam to carry a live load of 15 kN/m over simply supported span of 18m only for flexure. The characteristic strength of concrete is 35 MPa. Use Freyssinet cables of 12/5 with fy = 1750 MPa. Also design end block. Draw cable profiles at various sections. Check fiber stresses in concrete and deflection at mid-span. **[25]**

OR

***Q4)*** a) State the step by step procedure used in design of prestressed concrete flanged beam. **[7]**

b) A post tensioned prestressed concrete slab of size 7m × 10m with discontinuous edges is subjected to live load of 3.5 kN/$m^2$. Use three strands, each having cross sectional area 100$mm^2$ having fy = 1900MPa. Use M35 grade of concrete. Check the safety of slab against collapse and deflection at working load. **[18]**





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## SECTION - II

***Q5)*** Analyse the multistoried building frame of shown in fig. 1 for vertical load by substitute frame and for horizontal load by cantilever method. The frames are spaced 3.5 m c/c. The dead load and live load acting on panels with GH and HI are 3.6 kN/m$^2$ and 3.5 kN/m$^2$ respectively. The relatives stiffness of each member is marked on the figure. Also design continuous beam GHI for combined effect of vertical and horizontal loads. 15% redistribution of moments is permitted for vertical load moments. Use M20 and Fe415 materials. **[25]**

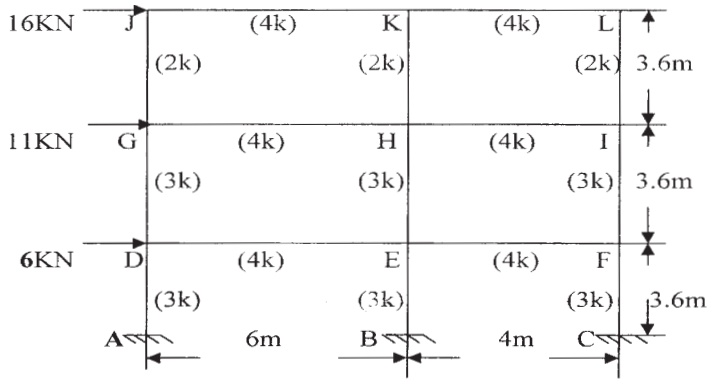


**Fig. 1**

OR

***Q6)*** a) Explain Seismic coefficient method. **[8]**

b) Analyse the multistoried building frame as shown in fig. 2 by portal method for lateral loads. The dead load and total design load acting on beam AB are 13 kN/m and 28 kN/m respectively and 19 kN/m and 42 kN/m over beam BC. The relative stiffness of beam is double than the column stiffness. Analyse the beam ABC for vertical load by substitute frame method. Calculate maximum span moment at BC and support moment at B. Design beam section (BC) for combined effect of vertical and horizontal loads. 10% redistribution of moments is permitted for vertical load moments. Use M20 & Fe415. **[17]**

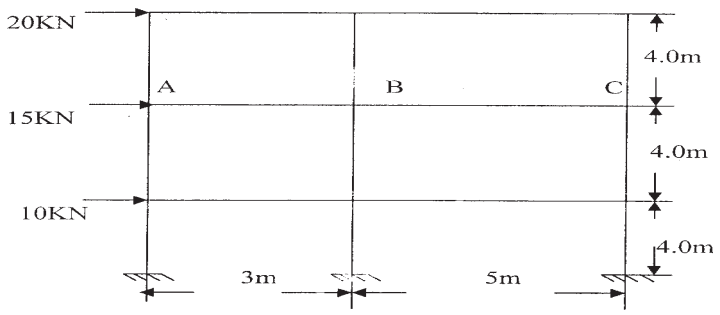


**Fig. 2**





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***Q7)*** a) At what situation, combined footing is recommended than isolated footing. **[5]**

b) Design an open circular water tank with rigid joints rest on ground. The capacity of tank is $5.5 \times 10^5$ liters. The height of tank is restricted to 4.25 m. Use M20 & Fe415 materials. Also design the bottom slab of a tank if S.B.C. of soil is 200 kN/m$^2$. Show pressure distribution diagram along the wall and reinforcement details. **[20]**

OR

***Q8)*** Design a cantilever T-shaped retaining wall to retain soil, 4m above the ground. The surcharge angle is 14º at the top of retaining wall. The unit weight of the soil is 17.5 kN/m$^3$, angle of repose is 35º and S.B.C. of soil is 180 kN/m$^2$ at 1.2 m below ground level. Show the pressure distribution at base of wall and reinforcement details at toe slab, heel slab and vertical wall. Use M20 concrete and Fe415 steel. **[25]**

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