Total No. of Questions : 6]

SEAT No. :

P5103

[Total No. of Pages : 3

BE/Insem.-503

B.E. (Civil)

STRUCTURAL DESIGN AND DRAWING - III

(2012 Pattern) (Semester - I)

Time : 1½ Hours] *[Max. Marks : 30*

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of non programmable electronic calculator is allowed.*
5) *Assume suitable data, if necessary.*
6) *Assessment will be based on complete solution and not on final answer.*
7) *IS 1343: 2012, IS 1893: 2002 and IS 456: 2000 are allowed in the examination.*

Q1) a) What are the various phenomena that contributes the loss of prestress? **[3]**

b) A beam spanning 3m supports a concentrated load of 68 kN at the center of the beam. Cross section of the beam is 250 mm wide by 300 mm deep. It is prestressed by a force of 540 kN at constant eccentricity of 60 mm. Neglecting the self-weight of beam, determine the location of the pressure line at the center, quarter span and support section of the beam. Draw sketch representing the locus of P-line and C-line. **[7]**

OR

Q2) a) Explain with help of sketches pre-tensioning and post-tensioning systems. **[4]**

b) A pretensioned beam has cross section as shown in the Fig.1. The beam has 4 cables each having 5 wires of 5 mm diameter carrying an initial stress of 1100 MPa. All wires are straight and run parallel to centroidal axis of the beam having ultimate strength equal to 1650 MPa. Determine the loss of prestress due to elastic shortening and normal relaxation of steel. Take modular ratio as 7.5. **[6]**

P.T.O.

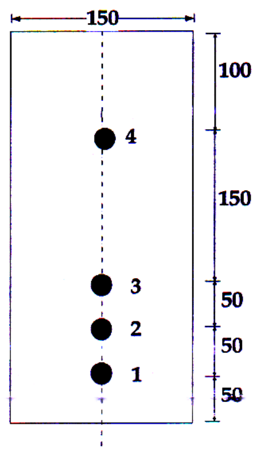

Fig. 1

Q3) a) A simply supported post tensioned slab, 500 mm thick has span of 10 m. The slab is prestressed by cables each containing 12 high tensile wires of 8 mm diameter. The cables are spaced at 500 mm centre to centre at an effective depth of 450 mm. Estimate the ultimate flexural strength of the slab. Also determine the maximum permissible uniformly distributed ultimate live load that can be placed on slab assuming. Consider load factors for live load and dead load as 1.5. Take f_{ck} = 40 MPa and f_p = 1600 MPa. **[5]**

b) A simply supported one way post tensioned slab is spanning over 10 m. The slab is required to support a live load of 10 kN/m^2. If f_{ck} = 30 MPa and compressive stresses are not likely to increase in service conditions, and structure is Type I, determine the minimum depth of slab required. Take loss ratio as 0.8 and the cube strength of concrete at transfer as 23 MPa. **[5]**

OR

Q4) a) The end block of a post tensioned beam is 300 mm × 500 mm and prestressed by Freyssinet cylindrical anchorage of 150 mm diameter as shown in the Fig. 2. The jacking force in anchorage is 900 kN. Design suitable anchorage zone reinforcement and sketch the detailing. **[5]**

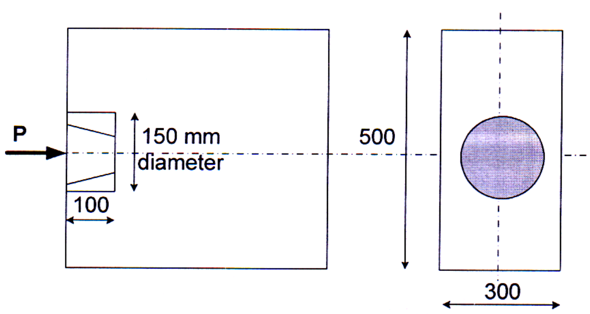

Fig. 2

b) For the problem of Q.4 (a), determine the ultimate shear resistance at support section and also design for shear as per IS: 1343. The ultimate shear force at the support section may be taken as 300 kN. The effective cover to the reinforcement is 50 mm and f_{ck} = 40 MPa. **[5]**

Q5) The bending moments developed due to gravity and earthquake loads for a continuous beam ABC are as follows : **[10]**

Bending Moments due to	Support moments at (kN-m)			Mid-span moments for span (kN-m)	
	A	B	C	AB	BC
Lateral load	± 90	± 90	± 90	0	0
Dead load	-50	-40	-50	+20	+20
Dead load + Imposed load	-75	-65	-75	+37	+37

Calculate the design moments developed due to gravity and earthquake loads using load combinations as per IS: 1893 and design the beam ABC for flexure.

OR

Q6) Determine the seismic forces in X and Y direction at each floor level for the residential RCC structure shown in the Fig. 3. The building is located in seismic zone V. The soil conditions are medium stiff The special moment resisting RC frames are in-filled with brick-masonry. The lumped weight due to dead loads may be taken as 12 kN/m². The floors are to cater a live load of 4 kN/m² on floors and 1.5 kN/m² on the roof. **[10]**

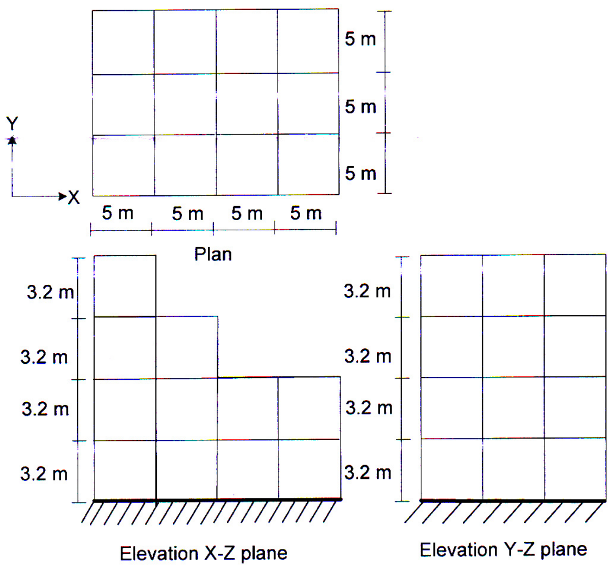

Fig. 3