Total No. of Questions : 6]

SEAT No. :

P5434

[Total No. of Pages : 3

B.E./INSEM/Oct.-3
B.E. (Civil)
STRUCTURAL DESIGN AND DRAWING - III
(2012 Pattern) (Semester - I)

Time : 1½ Hours] *[Max. Marks : 30*

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates 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: 2016 and IS 456: 2000 are allowed in the examination.***

Q1) a) Explain with neat sketches pre-tensioning and post-tensioning methods of pre-stressing. **[3]**

b) A pre-stressed concrete beam of 8 m span has a rectangular cross-section of 125 mm wide and 300 mm deep. The beam is pre-stressed with a cable with effective pre-stressing force of 180 kN provided along the longitudinal centroidal axis. The beam carries a uniformly distributed load of 2.25 kN/m including the weight of the beam. Locate the pressure line for the beam. Determine and draw the stress distribution at the support and mid-span sections of the beam. **[7]**

OR

Q2) a) Explain time dependent loss of pre-stress. **[3]**

b) A simply supported beam of span 6 m has a cross section of 400 mm x 600 mm. The pre-stressing force in the tendon is 1200 kN. Determine the profile of the load balancing cable at x = 0, L/4 and L/2 for each loading case. **[7]**

i) A uniformly distributed load of 40 kN/m over entire span.

ii) A central point load of 240 kN

iii) Two point loads of 120 kN at L/3 and 2L/3.

What will be change in the profile of load balancing cable in each of the above loading cases, if the beam is cantilever? Determine the eccentricities at x = 0, L/2 and L.

P.T.O.

Q3) a) Explain transmission zone for a pre-tensioned beam. What are the codal provisions for transmission length? **[2]**

b) A T- beam of 16 m length has the following properties. Top flange width and thickness are 500 mm and 200 mm, depth and thickness of the web are 600 mm and 200 mm respectively. **[8]**

The cable (f_p = 1600 MPa) of net area 2000 mm^2 is provided with parabolic profile with an eccentricity of 600 mm at the center of the span and 300 mm at the support. The effective pre-stress in the tendons is 1000 MPa. Grade of concrete = 40 MPa. Assume effective cover = 50 mm.

i) Estimate the shear resistance at the support section.

ii) Estimate the ultimate moment capacity of the T- section.

If the beam is subjected to udl of 40 kN/m, design the shear reinforcement if necessary.

OR

Q4) Design a post-tensioned concrete slab 6.0 m × 9.0 m with discontinuous edges. The slab is required to support imposed load of 4 kN/m^2. Check the safety of slab against collapse. Use M40 grade of concrete. **[10]**

Q5) Analyze the frame shown in Fig. 1 by Portal frame method. **[10]**

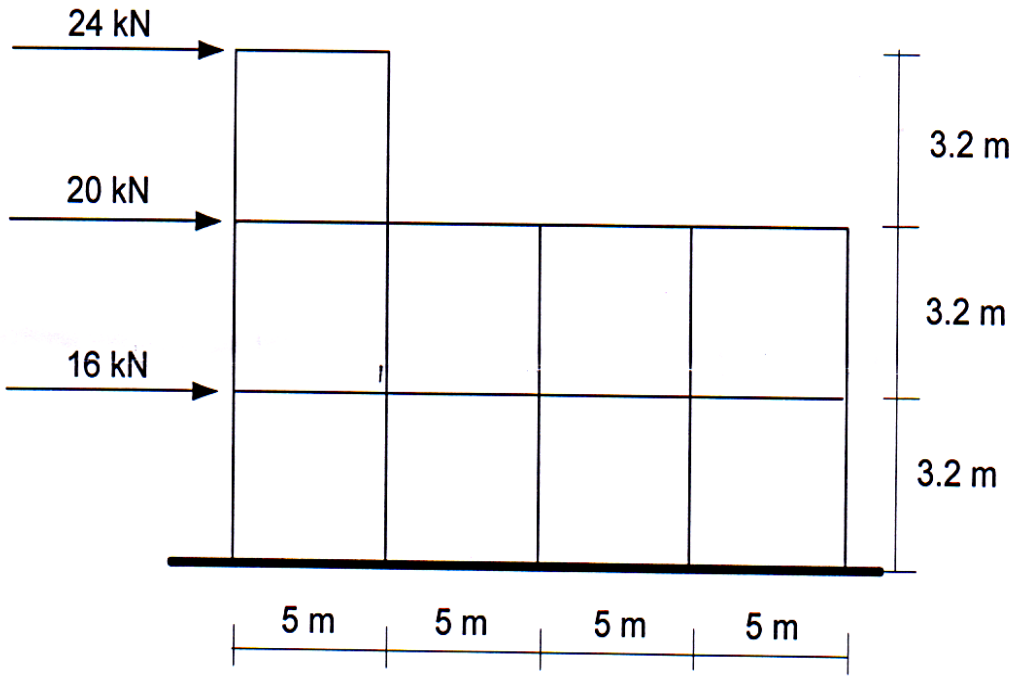

Fig. 1

OR

Q6) a) Explain the substitute frame method for the analysis of frame for gravity loads. **[3]**

b) Determine the seismic forces in X and Y direction at each floor level for the school building shown in the Fig. 2. The building is located in Pune. The soil investigation revealed a poorly graded sand with no fines having N = 20. Ordinary moment resisting RC frames are in-filled with brick-masonry are used in the building. The lumped weight due to dead loads may be taken as 10 kN/m^2. The floors are to cater a live load of 4 kN/m^2 on floors and 1.5 kN/m^2 on the roof. **[7]**

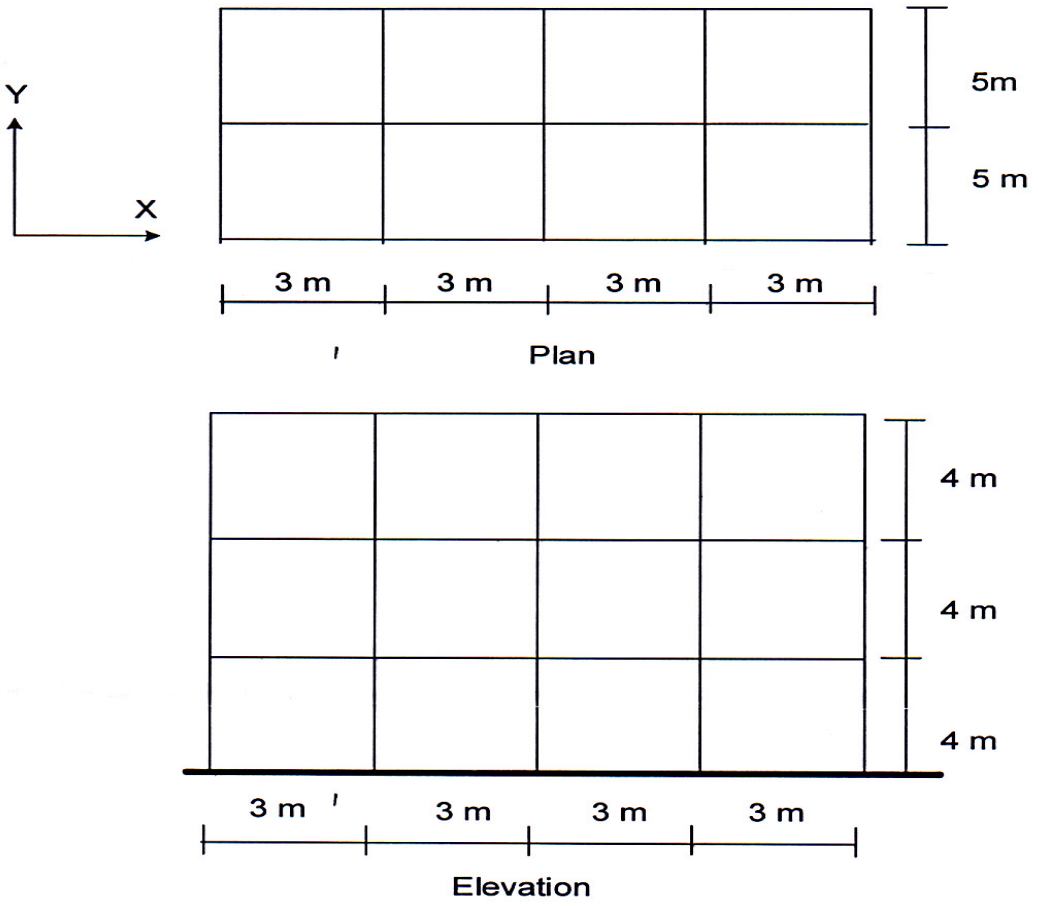

Fig. 2