Total No. of Questions : 6] **SEAT No. :**

P4913 **[Total No. of Pages : 2**

B.E./Insem. - 3
B.E. (Civil)
STRUCTURAL DESIGN - 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 sketches must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***IS : 1343-2012, IS : 1893 - 2002 and IS : 456 - 2000 are allowed in the examination.***
6) ***Use of electronic pocket calculator is allowed in the examination.***
7) ***Use of cell phone is prohibited in the examination hall.***

Q1) a) Explain stress, force and load balancing concept in prestressed concrete. **[3]**

b) A pre - tensioned concrete beam has a cross section 250 mm × 360 mm prestressed by a cable having a cross sectional area of 502 mm^2. The centroid of the cable is located at 105 mm from the soffit. Find the percentage loss of stress in steel due to creep, shrinkage, elastic shortening of concrete and 5% relaxation of stress in steel. The initial prestress in steel is 1000 MPa. **[7]**

Take E_s = 210 GPa, E_c = 36.8 GPa and creep coefficient = 1.6.

OR

Q2) a) Why high strength steel is used in prestressed concrete. Explain with suitable example. **[3]**

b) A prestressed concrete beam of 6 m span rectangular in cross section 400 mm × 600 mm is prestressed with a tendon having parabolic profile with an eccentricity of 100 mm at mid span and zero at supports. The tendon carries a prestressing force of 1000 kN. If the total external load on the beam (excluding its self - weight) is 15 kN/m, calculate the stresses in the extreme fibers at mid - span and at support sections. **[7]**

Q3) Design a two way slab of size 7.5 m × 10 m supported on four beams and discontinuous over one long edge. The slab supports a live load 5 kN/m^2. Use 6.3 mm - 7 ply strands having a nominal cross sectional area of 25.1 mm^2. The breaking load of the strand may be taken as 44.48 kN. The loss coefficient is 0.85. **[10]**

P.T.O.

OR

Q4) The cross section of a prestressed concrete beam is an unsymmetrical T section with the following dimensions : overall depth - 1200 mm, web - 200 mm and flange – (1000 × 200) mm. At a particular section the beam is subjected to ultimate moment and shear force of 2000 kNm and 250 kN respectively. Design the beam for shear with the following data : grade of concrete – M40, effective depth – 1100 mm, $A_p = 2310\ mm^2$, $f_p = 1500$ MPa, $\eta = 0.6$, effective prestress at extreme tensile face of the beam = 19.30 MPa. **[10]**

Q5) The plan and elevation of a three storey RC school building located in Pune is shown in Fig. 5. The building consists of OMRF and rests on hard soil. The sizes of structural components and loads are as follows : slab - 150 mm, beam- (230 × 450) mm, columns - (230 × 500) mm, live load on floors - 4.0 kN/m^2, live load on roof - 1.5 kN/m^2, floor finish - 1.0 kN/m^2, water proofing load - 2.0 kN/m^2. Analyze the frame using seismic coefficient method. **[10]**

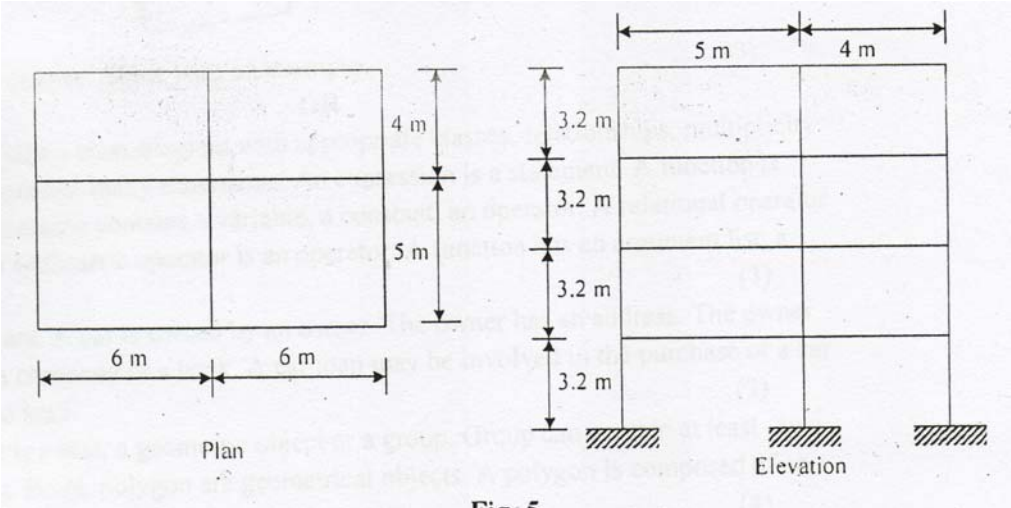

Fig. 5

OR

Q6) For the frame given in Q.5, analyze the first floor beam using appropriate substitute frames for obtaining maximum span and support moments. Sketch the bending moment diagrams. **[10]**

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