Total No. of Questions : 10]

SEAT No. :

P2112

[Total No. of Pages : 3

[5254]-503

B. E. (Civil)

STRUCTURAL DESIGN AND DRAWING - III

(2012 Pattern)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2; Q.3 or Q.4; Q.5 or Q.6; Q.7 or Q.8; and Q.9 or Q.10***
2) ***Figures in bold to the right, indicate full marks.***
3) ***IS 456, IS 1893, IS 1343, IS 3370 (Part II and Part IV) and IS 13920 are allowed in the examination.***
4) ***The designs should comply with the latest codal provisions.***
5) ***If necessary, assume suitable data and indicate clearly.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) a) Write shortnote on types of prestressing steel and explain the necessity of use high tensile strength steel in prestressing. **[4]**

b) A simply supported pre-stressed concrete beam having 9 m effective span is 250 mm wide and 500 mm deep. It carries a distributed load of intensity 6kN/m inclusive of self-weight. Pre-stressing force of 200 kN applied through a straight tendon located at 100 mm below the centroidal axis of the beam. Plot the pressure line. **[6]**

OR

Q2) a) Explain how the bearing stresses behind the anchorage are taken care of.**[4]**

b) A prestressed concrete beam having cross-section 250mm × 650mm deep is subjected to an effective prestressing force of 1380 kN along the longitudinal centroidal axis. The cables are symmetrically placed over bearing plate of 200mm × 400mm size. Find the bursting force and design the anchorage reinforcement. **[6]**

P.T.O.

Q3) a) Explain any four losses in pre-stressed member. **[4]**

b) A residential building of size 6m × 6m having two equal bays has a height of 10.5 m with each storey having height 3.5 m. The building is located in zone III. Soil conditions is medium stiff. OMRF is adopted. DL=10 kN /m^2 and IL=2 kN/m^2 Determine the design seismic forces for the building using seismic coefficient method as per IS 1893 and show the distribution of lateral forces with the building height. **[6]**

OR

Q4) a) Write a note on the serviceability limit state design criteria of pre- stressed member focusing on limits on compressive stress and crack control. **[4]**

b) The bending moments developed due to gravity and earthquake loads for a continuous beam ABC are as follows : **[6]**

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.

Q5) a) Explain with proper sketches, active and passive earth pressure diagram for a cantilever retaining wall with a shear key provided underneath the stem. **[4]**

b) Suggest a cantilever retaining wall with levelled backfill without a heel projection for retaining soil with the data given below and perform the stability analysis for it. The overall height of the wall = 5m, Weight of soil = 16kN/m^3. Angle of repose = 30°, Foundation shall not project on the retained side, SBC of soil = 200kN/m^2, Coefficient of friction = 0.45. **[12]**

OR

Q6) Design a L-shaped retaining wall to retain a backfill of 3.2 m. The backfill is horizontal. The unit weight of the soil is 18 kN / m^3, angle of repose = 30°, SBC of soil = 180 kN/m2. Sketch the details of reinforcement in the wall and base slab. **[16]**

Q7) A rectangular slab beam type combine footing is to be provided for two columns A and B located 4.5 m apart. They carry a service load of 650 kN and 1000 kN each. The sizes of columns are 400 mm × 400 mm and 600 mm × 600 mm respectively. The SBC of soil is 275 kN/m^2. Proportion the base slab for each of following conditions separately with comments on feasibility of footing. **[16]**

a) Width of slab restricted to 1.75 m

b) The projection of the footing to the length of footing beyond axis of column A is restricted to 0.75 m

c) Column A is boundary column

d) Column B is boundary column.

OR

Q8) A rectangular slab type combine footing is to be provided for two columns A and B located 4.5 m apart. They carry a service load of 650 kN and 1000 kN each. The sizes of columns are 400 mm × 400 mm and 600 mm × 600 mm respectively. The SBC of soil is 275 kN/m^2. Design the footing using M25 grade of concrete and steel of grade Fe 500. Sketch the reinforcement details. **[16]**

Q9) a) Explain the approximate analysis for **[12]**

i) A circular water tank fixed at base.

ii) Short wall of rectangular tank

iii) Long wall of rectangular tank for condition L/B < 2

b) Explain the limit state of serviceability for design of section of water tank subjected to both bending and direct tension. **[6]**

OR

Q10) Design the long wall for a rectangular water tank open at top resting on ground having a size of 8.0 m × 3 m × 2.5 m high. Use M 30 and Fe 500 grade material. Sketch details of reinforcement for the wall. **[18]**