Total No. of Questions : 10]

SEAT No. :

P3858

[Total No. of Pages : 3

[5561]-503
B.E. (Civil)
STRUCTURAL DESIGN & DRAWING - III
(2015 Course) (Semester - I)

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, Q.9 or Q.10.***
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 1893-2016 and IS 456.2000 are allowed in examination.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Use of cell phone is prohibited during examination.***

Q1) a) Explain Stress Concept and Load balancing concept used in Design of Prestress concrete member. **[3]**

b) A post-tensioned prestressed concrete beam with top flange 500 mm × 120 mm, web 120 mm × 600 mm and bottom flange 350 mm × 350 mm is simply supported over a span of 19 m and carries a UDL of 15 kN/m over entire span exclusive of its self-weight. It is prestressed with 5 numbers of 12/5 Freyssinet with zero eccentricity at supports and 400 at midspan. If initial prestress is 1030 Mpa. Calculate extreme fiber stress at initial and final stage. Assume loss ratio 0.85. Unit weight of prestressed concrete 25 kN/m^3. **[7]**

OR

Q2) a) Define the term Post-tensioning. What are various Post-tensioning methods? **[4]**

b) A prestress beam 250 mm wide and 360 mm deep is prestress by 10 wires of 8 mm diameter initial stress to 1000 N/mm^2. The centroid of steel wire is located at 105 mm from the soffit. Determine the maximum stress in concrete immediately after transfer allowing elastic shortening of concrete only at the level of the centroid of steel.

If, however the concrete is subjected to additional shortening due to creep and shinkage and the steel is subjected to relaxation of stress 5% find the final percentage loss stress in the steel wire. Modular ratio = 5.70, creep coefficient = 1.60. Total residual shrinkage strain = 3×10^{-4}. **[6]**

P.T.O.

Q3) a) Briefly outline the salient design features of continuous prestressed concrete flat slab. **[3]**

b) Design a post tensioned concrete two way slab 6m × 9m with discontinuous edge to support imposed load of 3 kN/m^2. Cables of 4 wires of 5 mm diameter carrying effective prestressing force of 100 kN are available for use. Design the spacing of the cables in both directions. Assume F_{ck} = 40 N/mm^2, F_p = 1600 N/mm^2, E_c = 38 kN/mm^2. **[7]**

OR

Q4) a) What are limitations of Direct Design Method for designing of flat slab? **[3]**

b) An end block of a post tensioned beam is 350 mm × 500 mm. The prestressing force is 900 kN with the tendon placed centrally at the ends. A bearing plate of 200 mm × 200 mm is provided. Check for the bearing stresses developed in concrete whose strength at transfer is 40 N/mm^2. **[7]**

Q5) Design a RCC T-shaped retaining wall to retain earthen embankment of 4.2 m height above the ground level. Embankment is sloping at an angle of 20º with horizontal. Unit weight of earth is 18 kN/m^3. Angle of repose is 30º. Good foundation is available at depth of 1.1 m below ground level. SBC of soil is 160 kN/m^2. Coefficient of friction between concrete and soil may be taken as 0.62. Use M20 and Fe 415. Sketch reinforcement details. **[17]**

OR

Q6) Design a cantilever L-shaped retaining wall to retain soil 4.6 m high above the ground level. The embankment is surcharged at an angle of 12º with horizontal. The SBC of soil is 200 kN/m^2 at a depth of 1.5 m below GL. An angle of repose is 35º, unit weight of backfill is 17 kN/m^3, coefficient of friction between wall and soil is 0.65. Give all the checks related to stability of retaining wall. Use M25 concrete and Fe 415 steel. Show the details of reinforcement at Heel and Stem portion. **[17]**

Q7) a) Design of circular water tank using IS code method for 1 lakh litres capacity. The joint between the wall and base of tank is rigid. The tank rests on ground. **[12]**

b) Explain the procedure to assess the crack width of flexure in water retaining structures as per latest codal provisions. **[5]**

OR

Q8) Design a rectangular tank of capacity 90,000 liters using approximate method of analysis. The height of water tank including free board 3.3 m. Tank is resting on firm ground. Use M20 and Fe415. Sketch reinforcement details. **[17]**

Q9) a) Evaluate the seismic design force in x and y direction of different floor level as per IS 1893 for **[12]**

i) LL Intensity = 3 kN/m^2

ii) FF = 0.75 kN/m^2

iii) Thickness of slab = 150 mm

iv) Size of Beam = 300 mm × 500 mm

v) Size of column = 300 mm × 600 mm

vi) Floor to floor height = 4 m

vii) No. of storeys = 5

viii) Brick wall thickness = 230 mm

ix) Seismic zone = IV

x) Strata is hard available.

Assume suitable data if necessary.

b) Define Degree of Freedom. Explain SDOF and MDOF with example. **[4]**

OR

Q10)a) Derive the equation of motion for damped free vibration of a SDOF system. **[8]**

b) Explain the approximate methods of analysis for lateral and vertical loading for multi-storey frame. **[8]**