Total No. of Questions : 10]

SEAT No. :

P3287

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[5461]-503

NOV/DEC.-18 B.E. (Civil)

STRUCTURAL DESIGN AND DRAWING - III

(2015 Pattern) (Semester - I) (End Sem.)

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

Instructions to the candidates:

1) ***Answer Q.1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.***
2) ***Neat sketches must drawn wherever necessary.***
3) ***Figures to 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) How to reduce loss due to friction. **[3]**

b) Determine ultimate shear resistance of the section cracked in flexure using IS 1343:2012. Section is unsymmetrical I-section with overall depth of 830mm, bw=130mm. Beam is subjected to ultimate moment of 573 kNm. Consider net ultimate shear force acting is 57 kN, fck=50 N/mm^2, fp=1750 N/mm^2, fpt=4.95 N/mm^2, Ixx=1.627×10^{10}mm^4 and Ap=1178mm^2. **[7]**

OR

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

b) A prestress beam 250mm wide and 360mm deep is prestress by 10 wires of 8mm 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. **[6]**

If, however the concrete is subjected to additional shortening due to creep and shrinkage 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}.

P.T.O.

Q3) a) The deck slab of road bridge of span 10m is a one way PSC slab with parallel post tensioned cables. Force at transfer in each cable is 400kN. Deck slab is supposed to support a UDL of 25 kN/mm^2. Compressive and tensile stress in concrete at any stage doesn't exceed 12 N/mm^2 and o N/mm^2 respectively. Determine the only depth of slab assuming 20% prestressing loss. **[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 5mm 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 = 38kN/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 L-shaped retaining wall for levelled backfill for following data. Height of retaining wall is 4.62 m, angle of internal friction 30º, unit weight of soil is 18 kN/m^3, surcharge load is 20 kN/m^2 and SBC is 180 kN/m^2. Coefficient of friction between base slab and underlying strata is 0.55. Draw lateral pressure diagram and details of reinforcement detailing of base and stem showing curtailment. **[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 in flexure in water retaining structures as per latest codal provisions. **[5]**

OR

Q8) Design a rectangular tank of capactiy 90,000 litters using approximate method of analysis. The height of water tank including free board 3.3m. 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 = 300mm x 500 mm

v) Size of column = 300mm x 600mm

vi) Floor to floor height = 4m

vii) No. of storeys=5

viii) Brick wall thickness=230mm

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]**