Total No. of Questions : 10]

SEAT No. :

P2951

[Total No. of Pages : 3

[5154]-503
B.E.(Civil)
STRUCTURAL DESIGN AND DRAWING - III
(2012 Pattern) (Semester-I) (End Sem.) (401003)

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

Instructions to the candidates:

1) ***Answer Q1or Q2; Q3 or Q4; Q5 or Q6; Q7 or Q8; and Q9 or Q10.***
2) ***Figures to the right indicate full marks.***
3) ***IS 456, Is 1343, IS 3370 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 calculater is allowed.***

Q1) a) Explain any two post tensioned prestressing systems. **[4]**

b) A simply supported post tensioned concrete beam of span 15 m has a rectangular cross section 300 mm× 800 mm. The prestress at ends is 1300 kN with zero eccentricity at the supports and an eccentricity of 250 mm at the center, the cable profile being parabolic. Assuming k=0.15/ 100 m and μ =0.35, determine the loss of stress due to friction at the center of the beam. **[6]**

OR

Q2) a) What role does high grade materials play in prestressed concrete. **[4]**

b) A simply supported prestressed T-beam of 16 m span 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. The beam is prestressed with HT steel of c/s area of 2000 mm^2. The cable profile is parabolic with an eccentricity of 600 mm at the center of the span and 300 mm at the support section.The effective prestress in the tendons is 1000 N/mm^2. Estimate the ultimate shear resistance at the support section, and the maximum permissible uniformly distributed load on the beam. **[6]**

P.T.O.

Q3) a) A prestressed concrete I section beam is simply supported over a span 8 meters supporting a live load of 4 kN/m. The beam has overall depth of 400 mm. The thicknesses of flange and web are 60 mm and 80 mm respectively. The width of the flange is 200 mm.Find the eccentricity required for the prestressing force of 235 kN such that the resultant stress is zero at the bottom fibre of the central section. **[4]**

b) Calculate the base shear for an unbraced building located in Pune. The building is having plan dimensions 25 m× 25 m having 5 similar bays in both direction. The soil conditions are medium stiff. The R.C. frames are in filled with brick-masonry. The lumped weight due to dead loads is 12 kN/m^2 on floors and 10 kN/m^2 on the roof. The floors are to cater for a live load of 4 kN/m^2 on floors and 1.5 kN/m^2 on the roof. The total height of the building is 14 m with floor height as 3.5 m. Also show shear distribution over the height of the building. **[6]**

OR

Q4) a) Explain the approximate method of analysis for gravity loads for a multistory frame. **[4]**

b) A continuous three span beam ABCD have equal span of 6 m. The design data for the beam is

$M_A(-)$ = 78.07 kNm; $M_B(-)$ = 127.92 kNm; M_{AB} (+) = 74.41 kNm and M_{BC} (+) = 61.45 kNm.

Earthquake moments is 210 kNm.

Design the beam ABCD for combined effect of lateral and gravity loads for flexure only. **[6]**

Q5) a) Draw the active earth pressure diagram on a retaining wall showing the expression for maximum earth pressure for the following conditions.**[4]**

i) Backfill is inclined at angle α, where angle α is less than angle of repose of soil and

ii) Backfill is horizontal with uniform surcharge Ws/unit run at a distance 'a' form the steam and 'a' < height of stem.

b) Provide a T- shaped retaining wall to retain a horizontal leveled backfill of height 5 m. It is subjected to a surcharge of 10 kN/m^2 from the face of the wall. The backfill has unit weight of 17 kN/m^3 Angle of repose = 30^o, coefficient of friction between concrete and soil = 0.55, SBC of soil = 150 kN/m^2, depth of foundation = 1.0 m. Perform stability analysis. **[12]**

OR

Q6) A L-shaped retaining wall is to be provided to retain a backfill of 4.2 m.The backfill is horizontal.The unit weight of the soil is 17 kN/m^3, angle of repose=30°, SBC of soil = 180 kN/m^2, good foundation is available at a depth of 1.0 m.Design and sketch the details of reinforcement in the wall and base slab. **[16]**

Q7) a) Two columns C_1 and C_2 are spaced at 3.0 m apart carrying 650 kN and 800 kN respectively. If the width of footing is restricted to 1.8 m and C_1 is boundary column. Safe bearing pressure of soil is 180 kN/m^2. Column size are 500 mm×500 mm. Comment on the feasibility of providing rectangular slab type combined footing. **[3]**

b) Design a slab type combined footing for two boudary columns spaced 4.0 m apart. The two columns of size 230 mm×450 mm carry service loads of 700 kN each. The safe bearing pressure on soil is 180 kN/m^2. Use M30 grade of concrete and steel of grade Fe 500. **[13]**

OR

Q8) Design a slab-beam type combined footing for two columns spaced 3 m apart carrying a service load of 800 kN and 1000 kN each. The columns are 400 mm×400 mm and 500 mm×500 mm respectively . The SBC of soil is 190 kN/m^2. Use M30 grade of concrete and steel of grade Fe 500. **[16]**

Q9) a) Determine the maximum bending moments at mid-span and support as per IS 3370 in the long wall and short wall of a rectangular water tank resting on ground. The tank dimensions are 5 m×2 m×3 m high is the tank wall is free at top and hinged at bottom. **[6]**

b) The wall of a circular water tank with flexible base has thickness of 300 mm. It is subjected to a maximum hoop tension of 240 kN. The reinforcement provided is 12 # @ 100 mm c/c. The material used are Fe 500 grade of steel and M 35 grade of concrete. Find the crack width and check for serviceability if the limiting design surface crack width is taken as 0.2 mm. **[12]**

OR

Q10)Design the water tank open at top resting on ground having a size of 5.0m× 5.0m× 3m high.Use M 30 and Fe 500 grade material. Sketch details of reinforcement for the wall. **[18]**