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

P549 **[Total No. of Pages : 2**

OCT/BE/Insem.-503

B.E. (Civil)

STRUCTURAL DESIGN AND DRAWING -III

(2015 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 diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non programmable electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Assessment will be based on complete solution and not on final answer.***
7) ***IS 1343:2012 and IS 456:200 are allowed in the examination.***

Q1) a) Explaining with suitable diagram, the concept of prestressing. Justify the use of high grade materials in prestressed member. **[3]**

b) A 12 m long post tensioned concrete beam of rectangular cross section 450 mm × 600 mm is prestressed by strands carrying initial prestressing force of 550 kN. The cross sectional area of the strands is 40 mm^2. If all strands are tensioned simultaneously, find the loss due to elastic shortening of concrete. Calculate the percentage loss due shrinkage for relative humidity 50% at the end of eight months. M50 grade of concrete is used with the transfer of the stress taking place at 14 days. **[7]**

OR

Q2) a) Give the merits and demerits of Prestressed Concrete over Reinforced Cement Concrete. **[4]**

b) A rectangular concrete beam 300 mm × 400 mm dep is prestressed by a force of 540 kN at an constant eccentricity of 60 mm. The beam supports a concentrated load of 80 kN at the center of a span of 3 m. Determine the location of pressure line at center, quarter span and support section of the beam. Neglect the self weight of the beam. Find the stresses at the support and midspan using any method. **[6]**

P.T.O.

Q3) a) Using the codal provisions of IS 1343:2012, determine ultimate shear resistance of the support section. Section is unsymmetrical I-section with overall depth of 1000 mm, bw=150 mm. Top flange 500 × 250 mm and bottom flange 350 × 300 mm. The beam is subjected to prestressing force of 1597.47 kN at an eccentricity of' 50 mm above the neutral axis at support and 150 mm below the neutral axis at midspan. Take loss ratio as 0.8. The ultimate shear force of 227.1 kN exists at support section. Consider fck 40 N/mm^2. Design the support section for limit state of collapse: shear. **[5]**

b) Explain in brief the design of bursting reinforcement in the end block in post tensioned prestressed concrete girder and concept of transmission length in pretensioned beam. **[5]**

OR

Q4) a) A simply supported one way post tensioned slab supporting a live load of 12 kN/m^2 is spanning over 10 m. The grade of concrete used is M40 and the cube strength of concrete at transfer as 30 MPa. The compressive stresses are not likely to increase in service conditions. Determine the minimum depth of slab required if it is to be designed as **[7]**

i) Type I Structure,

ii) Type II Structure. Take loss ratio as 0.8.

b) Explain the limit state of serviceability criteria for design of slabs. **[3]**

Q5) A PT flat slab of a large hall measures 15m × 20m. The slab is supported by columns (500 × 500) mm arranged at 5.0 m c/c along both the directions. The thickness of the flat slab is 160 mm. The size of drop is 1.8m × 1.8m and has a thickness of 240mm. The imposed load on the slab is 3.5 kN/m^2. The effective cover is 30 mm. In the interior panel along the longer direction calculate the range of eccentricities at interior support and mid-span. **[10]**

OR

Q6) A PT flat slab of a large hall measures l5m × 20m. The slab is supported by columns (500 × 500) mm arranged at 5.0 m c/c along both the directions. The thickness of the flat slab is 160 mm. The size of drop is 1.8 m 1.8 m and has a thickness of 240mm. The imposed load on the slab is 3.5 kN/m^2 The effective cover is 30 mm. In the exterior panel (for the end-span) along longer direction, calculate the range of eccentricities at end-support. mid-span and interior support. **[10]**

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