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Printed Pages : 3

BT–7 / M–17
DESIGN OF CONCRETE STRUCTURES–II
Paper–CE–401 E

Time allowed : 4 hours] *[Maximum marks : 100*

Note : *Attmept five questions, selecting at least one question from each unit.*

Use of IS : 456 2000 is allowed. Use of SP-16 is not allowed. Assume any missing data appropriately. Use M25 concrete and Fe415 grade steel.

Unit–I

1. A continuous reinforced concrete rectangular beam of size 300 × 500 mm (overall) is subjected to an elastic factored moment of 300 kN-m at an interior support. The beam is provided with 3 × 16 mm ϕ bars at bottom of the section over the support at a nominal cover of 25 mm. If the moment redistribution is limited to 30 percent, calculate the tension steel required to carry the moment. Use concrete mix of grade M20 and HYSD steel of grade Fe-415 as construction material. 20

2. (a) Explain losses in prestress briefly. Also explain why high strength concrete and high strength steel are used in pre-stressed concrete. 8

(b) A simply supported post-tensioned pre-stressed concrete beam of size 400 × 1000 mm is provided over an effective span of 16 m. The beam has to carry live load of 60 kN/m. Provide a suitable cable profile and the magnitude of pre-stressing force to completely offset the live load. 12

Unit–II

3. (a) Write the advantages and disadvantages of flat slab construction. 6

(b) Design a dog legged stair for a building in which the vertical distance between the floors is 3.6 m. The stair hall measure 2.5 m × 5 m. The live load may be taken as 2500 N/m^2. 14

4. Two columns of size 400 mm × 400 mm each are spaced at 4.4 m centre-to-centre. The columns carry axial compressive load of 800 kN and 1000 kN respectively. Both the columns are on the property line and the footing cannot extend beyond 200 mm from the exterior face of the column. Design suitable combined footing for both the columns. Take net bearing capacity of the soil as 100 kN/m^2. 20

Unit–III

5. (a) In what way, the design of water retaining RC structures differs from non-water retaining RC structures ? Explain briefly. 5

(b) A circular water tank of diamter 8 m and height 5 m is having flexible connection with the floor slab. Design the vertical wall of the tank. Also draw the joint details. 15

6. Design a bunker to store 300 kN of coal, for the following data :

Unit weight of coal = 8340 N/m^3, Angle of repose = 30 degree. The stored coal is to be surcharged at its angle of repose. 20

Unit–IV

7. A 110 mm thick reinforced concrete slab of size 4.5 × 6 m is reinforced with 10 mm dia bars @ 140 mm and 180 mm centre-to-centre is short and long directions respectively, at a clear cover of 20 mm. Find the ultimate moments m_{ub} and m_{ul} per unit length, for the yield lines inclined at 45 degree to either direction of reinforcement. 20

8. (a) Discuss in brief the method of analysis of a substitute frame. 6

(b) An RC frame consists of beams having spans 5.5 m centre to centre. A typical floor inner beam carries a negative bending moment of 550 kN-m and shear force of 350 kN at the face of the beam-column joint due to gravity and earthqueake loads. Design the beam section for ductility. 14