AU – 2838

Seventh Semester B. E. (Civil Engineering) Examination

STRUCTURAL DESIGN – II

Paper – 7 CE 03

(USC – 10215)

P. Pages : 3

Time : Four Hours] [Max. Marks : 80

Note : (1) Separate answer book must be used for each section in the subject Geology, Engineering material of civil branch and Separate answer book must be used for Section A and B in Pharmacy and Cosmetic Tech.
(2) Answer **Two** questions from Section A and **Two** questions from Section B.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data wherever necessary.
(5) Illustrate your answer wherever necessary with the help of neat sketches.
(6) I.S. code 1343 (1980) I.S. 456(Revised) I.S. 3370 may be consulted.
(7) Use pen of Blue/Black ink/refill only for writing the answer book.

SECTION A

1. Design an interior panel of a flat slab 4.0 m x 4.0 m (centre to centre). Take live load as 4 kN/m^2. Assume weight of floor finishes as 1.0 kN/m^2. The flat slab shall be provided with drop panel column capital should not be provided. Dimension of columns 450 mm x 450 mm. Use M 25 concrete and Fe–415 steel. Show the reinforcement details. 20

OR

2. A cantilever type retaining wall has 4.0 m above ground level. It retain earth upto its top. The depth of foundation below ground 1.5 m. Safe bearing capacity of soil and weight of soil are 220 kN/m^2. and 20 kN/m^3 respectively. Angle of repose of soil is 30^0. Use M 25 concrete and Fe–415 steel. Design the stem for cantilever retaining wall and show the details of reinforcement in stem with one curtailment. 20

3. Design a combined footing for two columns carrying factored load of 1600 kN and 1800 kN respectively. The size of columns 450 mm x 450 mm. Columns are

spaced at 5.0 m apart (c/c). Safe bearing capacity of soil is 230 kN/m^2. Adopt M 25 concrete and Fe–415 steel. Draw detail sketches of reinforcement to be provided. 20

OR

4. Design a slab and beam of cantilever shed for a bus stop. The shed is 3.8 m wide and 3.0 m high above the ground level and shall consist of a 120 mm thick slab supported on frames 2.6 m centre. Use M 20 concrete and Fe–415 steel. Assume suitable data if required. Show the reinforcement details. 20

SECTION B

5. (a) Discuss the advantages and disadvantages of prestressed concrete over RCC. 5

(b) An unsymmetrical I–section beam is used to support an imposed load of 5 kN/m over a simply supported span of 10 m. The sectional details are top flanges 400 mm wide and 100 mm thick, bottom flanges 200 mm wide and 100 mm thick. Thickness of web = 100 mm. Overall depth of beam = 550 mm. At the centre of the span the effective prestressing force of 250 kN is located at 200 mm from soffit of the beam. Estimate the stresses at the centre of span section of the beam for the given load combination:

(a) Prestress + self wt.

(b) Prestress + self wt. + live load. 15

OR

6. (a) What is post–tensioning and pre-tensioning methods. 6

(b) A pretensioned beam 300 mm wide and 550 mm deep is prestressed by 16 wires of 6 mm diameter initially stressed to 1200 N/mm^2, with their centroid located 150 mm from the soffit. Find the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete. If the concrete undergoes a further shortening due to creep and shrinkage with there is a relaxation of 5% steel stress. Estimate the final percentage loss of stress in the wires for the following data :

Es = 210 kN/mm^2 , Ec = 35 kN/mm^2

Creep coefficent (ϕ) = 1.6

Total residual shrinkage strain = 3×10^{-4} 14

7. A post-tensioned prestressed concrete beam of rectangular cross section carries uniformly distributed load of 30 kN/m over a span of 10 m including its self weight. Design the section if Fch = 40 N/mm^2 and Fp = 1600 N/mm^2. Consider load intensity as working value. Design by limit state method. 20

OR

8. A cylindrical prestressed concrete water tank of internal diameter 28 m is required to store water over a depth of 6.4 m. The permissible compressive stress in concrete at transfer is 13 N/mm^2 and the minimum compressive stress, under working pressure is 1 N/mm^2. The loss ratio is 0.75 wires of 6 mm diameter with an initial stress of 1000 N/mm^2 are available for circumferential winding and freyssinet cubles made up of 14 wires of 7 mm diameter stressed to 1200 N/mm^2 are to be used for vertical prestressing. Design the tank wall assuming the base as fixed. The cube strength of concrete is 40 N/mm^2. 20