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320811(20)

B. E. (Eighth Semester) Examination, April-May 2020

(Old Scheme)

(Civil Engg. Branch)

STRUCTURAL ENGINEERING DESIGN-IV

Time Allowed : Four hours

Maximum Marks : 80

Minimum Pass Marks : 28

*Note : Part (a) of each question is compulsory and attempt any **one** part from (b) and (c) of each unit. Use of IS code 456:2000 is permitted.*

Unit-I

1. (a) What are the circumstances for providing combined footings?   2

(b) Design combined rectangular footing for two columns A and B carrying loads of 500 and 700 kN respectively. Column A is 300 × 300 mm in size and column B is 400 × 400 mm in size. The centre to centre spacing of the columns is 3·40 m. The size of soil may be taken as 150 kN/m². Use M-20 concrete and Fe415 steel. 14

(c) Define combined trapezoidal footing. Why trapezoidal combined footing need to provide. Write the design steps for trapezoidal combined footing giving suitable formulae. 14

Unit-II

2. (a) Define counter tort retaining wall. 2

(b) Design a T-shaped cantiliver retaining wall to retain earth embankment 3 m high above ground level. The unit weight of earth is 18 kN/m³ and its angle of repose is 30°. The embankment is horizontal at its top. The safe bearing capacity of soil may be taken as 100 kN/m² and coefficient of friction between soil and concrete as 0·5. Use M-20 mix and Fe415 bars. 14

(c) Design a cantilever retaining wall for a road for the following requirements : 14

(i) Height of wall from the bottom of base to top of stem = 6 m.

(ii) Super imposed load due to road traffic = 18 kN/m².

(iii) Unit weight of fill = 18 kN/m³.

(iv) Angle of internal friction for till material = 30°.

(v) Allowable bearing pressure on ground = 160 kN/m².

(vi) Coefficient of friction between concrete and ground = 0·4.

(vii) Provide a parapet wall 1 m high on the top of stem. Use M-20 concrete and Fe415 steel.

Unit-III

3. (a) Name different types of water tanks. 2

(b) Design a circular tank, with domical top for capacity of 4,00,000 litre. The depth of water is to be 4 m, including a free board of 20 cm. The tank is to be supported on masonry tower. Take unit weight of water as 9800 kN/m³. 14

(c) Design of Intze tank (tank part only) of 900,000 litres capacity. The height of staging is 16 m upto bottom of tank. Use M-20 concrete and HYSD bars. 14

Unit-IV

4. (a) List different types of loads & forces occurs in the road bridges. 2

(b) What are the general requirements for design of bridges? 14

(c) Design a solid slab bridge for class A loading for the following data :

(i) Clear span = 4·5 m

(ii) Clear width of roadways = 7·0 m

(iii) Average thickness of wearing coat = 80 mm.

Use M-20 mix and Fe-415 bars. Take unit weight of concrete 24000 N/m³. 14

Unit-V

5. (a) What are the different concepts of design of pre-stressed concrete? 2

(b) A simply supported prestressed concrete beam of rectangular cross section 400 × 600 mm is loaded with a total uniformly distributed load of 256 kN over a span of 6 m. Sketch the distribution of stresses at mid span and end section if the prestressing force is 1920 kN and tendon is (a) concentric (b) eccentric located at 200 mm above the bottom fibre. 14

(c) What are the different between pre tensioning and post tensioning systems? Explain different kinds of post tensioning systems. 14