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320831(20)

B. E. (Eighth Semester) Examination, April-May 2021

(New Scheme)

(Civil Engg. Branch)

STRUCTURAL ENGINEERING DESIGN-IV

Time Allowed : Four hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Part (a) is compulsory in each question. Attempt any one part from (b) & (c) for question having 14 marks and two where question (b), (c) and (d) which have 7 marks. Use IS 456 : 2000, IRC 6 & 21 permitted. Assume suitable data and draw neat sketch wherever required. Use M-20 and Fe-415 steel for all. Question unless otherwise stated. Right side digit indicates marks.*

Unit-I

1. (a) What is strap footing? 2

(b) Design a combined rectangular footing for two

column A and B, carrying a load of 500 kN and 700 kN respectively. Column A is 300 mm × 300 mm in size Column B, 400 mm × 400 mm in size. The c/c spacing of the column is 3·4 m. The safe bearing capacity of soil may be taken as 150 kN/m^2. Use M-20 concrete and Fe-415 steel. 14

(c) Design a combined trapezoidal footing for two column A and B, spaced 5 m c/c. Column A 300 mm × 300 mm in size and carrying a load of 600 kN. Column B 400 mm × 400 mm in size and carrying a load of 900 kN. The maximum length of footing is restricted to 7 m only. The safe bearing capacity of soil as 120 kN/m^2. Use M-20 concrete and Fe-415 steel. 14

Unit-II

2. (a) Differentiate between active earth pressure and earth pressure. 2

(b) Design a T-shaped cantilever retaining wall to retain embankment 3 m high above ground level. The unit weight of earth is 18 kN/m^3 and its angle of repose is 300. The embankment is horizontal at its top. The safe bearing capacity of soil my be taken as 100

kN/m^2. The coefficient of friction between soil and concrete as 0·5. Use M-20 concrete and Fe-415 steel bar. 14

(c) Design a counterfort retaining wall to retain 7 m. High embankment above ground level. The foundation is to be taken 1 m deep where the safe bearing capacity of soil may be taken as 180 kN/m^2. The top of the earth retained being horizontal with density of 18 kN/m^3 and angle of internal friction be 30° and coefficient of internal friction found 0·5 between concrete and soil. 14

Unit-III

3. (a) Explain in brief different types of water tanks. 2

(b) Design a circular tank with flexible base for capacity 40,000 liters of water. The depth of tank is to be 4 m including a free board of 200 mm. Use M-20 grade of concrete and Fe-415 steel. Redesign the tank assuming that the joint between the wall and base is rigid. 14

(c) Write the design steps of Intze type tank. Write design steps for the following : 14

(i) Design of top dome

(ii) Top ring beam

(iii) Cylindrical side walls

(iv) Bottom ring beam connecting side walls with conical dome

(v) Design of conical dome

Unit-IV

4. (a) Name the various types of load considered during the design of RCC bridge. 2

(b) Design a solid slab bridge for class A loading when the clear span is 4.5 m. Clear width of road way is 7 m, Average thickness of wearing cost is 80 mm and unit weight of concrete is 24000 N/m^2. Use M-20 and Fe-415. 14

(c) Design a cantilever slab and inner panel of a T beam bridge for class AA (tracked) vehicle loading only for following data : 14

Clear width of roadway : 7 m

Span center to center of bearing : 16 m

Live load one lane class AA loading track vehicle only.

Average thickness of wearing coat : 8 cm

Use M-20 concrete mix and Fe-415 steel. 14

Unit-V

5. (a) Define prestressed concrete. 2

(b) What are the various losses in prestressing? Give their formula and explain them. 7

(c) What are different methods of prestressing? Explain in details. 7

(d) A pretensioned prestress concreete beam of 9 m span has cross section 400 mm × 800 mm, and is prestressed with 2400 kN at transfer. The cable has cross sectional area of 2000 mm^2 of steel and has a parabolic profile with max. eccentricity of 120 mm at the middle of span. Determine the loss of prestress. Given $E_s = 2{\cdot}1 \times 10^5$ N/mm^2. Use M-30 concrete. Assume ultimate tensile strength of prestressing steel as 1500 N/mm^2. 7