

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



VI SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, MAY/JUNE 2016

SUBJECT: STRUCTURAL DESIGN III (CIE 304)

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- * Answer **ANY FIVE FULL** the questions.
- ✤ Missing data may be suitable assumed.
- ◆ Use of IS: 456-2000 and SP 16: 1980 is permitted

1.	Design the wall of a circular tank with fixed base for following data, Diameter of the tank = 8 m, Height of water tank including a free board of 0.15 m = 5 m, Overall wall thickness = 150 mm, Effective cover = 45 mm, σ_{st} = 130 N/mm ² , σ_c = 1.5 N/mm ² & σ_{cbc} = 10 N/mm ² . Check whether the tank wall thickness provided is sufficient or not. Also, design base slab of the tank. Use 12# bars as main reinforcements.	10
2.	Following are the details of a rectangular water tank, Internal dimensions of tank = 5 m × 3 m, Height of the tank = 2.5 m (inclusive of a free board of 0.12 m), Overall thickness of tank wall = 200 mm, Effective cover = 45 mm. Grade of concrete = M30, Grade of steel = Fe 415, σ_{st} = 130 N/mm ² , σ_c = 1.5 N/mm ² & σ_{cbc} = 10 N/mm ² . Calculate reinforcements required at mid spans of both long and short walls.	10
3.	Design an intermediate flight of a waist slab type open well staircase (3 flights between two floors). Use M25 concrete and Fe 500 steel. Clear span of intermediate flight = 3.88 m, width of flight and landing = 1.1 m, tread = 280 mm, rise = 160 mm, waist-slab thickness = 190 mm with 30 mm effective cover, thickness of supporting wall = 300 mm, live load = 3.8 kN/m ² and floor finish load = 0.5 kN/m ² . Check for shear and deflection. Draw a sketch showing the details of reinforcements.	10
4.	Details of an interior panel of a flat slab are as follows. i) Panel dimensions 7.5 m x 6.0 m ii) Column strip = 3 m (2 x 1.5 m) iii) Drop dimension is 3.0 m x 3.0 m iv) Drop thickness = 100 mm v) Slab thickness = 240mm, inclusive of 30 mm effective cover vi) Column head diameter = 1.20 m v) Column size = 500 mm diameter vi) Live load and floor finish load are 6.6 kN/m ² 0.9 kN/m ² respectively. Use M 25 concrete and Fe 500 grade steel. Design column strip completely along longer span and middle strip along shorter span. Check for punching shear and depth is not required.	10
5.	The details of a counterfort type retaining wall are as follows, Height of soil to be retained=6.5 m. Depth of foundation =1.5 m. Width of base slab = 5.2 m. Width of toe slab =1.7 m. Thickness of stem = 250 mm. Spacing of counterforts = 2.8 m c/c. Weight density of soil-18 kN/m ³ .	

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Materials to be used are M 20 concrete and Fe 415 steel. Consider an effective cover of 50 mm. Maximum pressure below the footing at the end of the toe is 109.64 kN/m² and minimum pressure at the end of the heel slab is 106.41 kN/m². Angle of repose = 30°. Design the heel slab, toe slab and stem. Check heel and toe for shear. Depth checks and Stability checks are not required.
A 250 mm × 750 mm column carries a service load of 1200 kN and a moment of 120 kN.m about major axis. Size of the footing is 5.1 m × 1.7 m. The allowing bearing pressure on soil is 180 kN/m² at 1.6 m depth. Design an isolated rectangular footing. Use M 30 grade concrete and Fe 415 steel. Check for one way shear only. Calculate reinforcement required for longer side of footing only.