Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, MAY/JUNE 2022

SUBJECT: **DESIGN OF REINFORCED CONCRETE STRUCTURES [CIE 4063]**

REVISED CREDIT SYSTEM

(_ / / 2022)

Time: 3 Hours Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions. All the members are RCC
- Any missing data may be suitably assumed
- Usage of IS 456:2000 and SP16 is allowed

Q.No		Marks	CO
1A.	Explain punching shear calculation in flat slabs. Write the allowable shear stress in flat slabs as per limit state method.	4	1
1B.	Explain the procedure to determine deflection in a grid floor using plate theory with a neat sketch.	3	1
1C.	Determine the dimensions of 3m diameter circular bunker to store 24 tonnes of coal. Density and angle of repose of coal are 8kN/m^3 and 30° respectively.	3	5
2A.	Determine factored bending moments for an interior flat slab panel of size 6m x 6m with drop and panel head for a Live Load of 4kN/m^2 and dead load due to self-weight. The slab is supported by columns of size 0.6 m 0.6 m.	7	2
2B.	Determine the plan dimensions of a rectangular combined footing for two columns C_1 and C_2 of cross section 500 mm x 500 mm, supporting axial loads P_1 = 1200kN and P_2 = 1600 kN respectively under service axial load. The column C_1 is an exterior column whose exterior face is flush with the property line. The centre-to-centre distance between C_1 and C_2 is 5m. the allowable soil pressure at the base of the footing, 1.5m below ground level, is 180kN/m^2	3	3
3A.	A cantilever retaining wall is to be designed for the following data: Height of the earth to be retained = 3m, γsoil = 18 kN/m^3, φ = 30°, The safe bearing capacity = 180 kN/m^2, μ = 0.5, M20 concrete and Fe4l5 steel. Calculate the dimensions of components of retaining wall.	5	3
3B.	A rectangular combined footing of 2.2 m x 6 m is provided for two columns C_1 and C_2 of cross section 450 mm x 450 mm. The columns are connected using a beam of section 500 mm x 800 mm. The columns C_1 and C_2 carry the factored loads of 1600 kN and 900 kN respectively. The column C_2 is an exterior column whose exterior face is flush with the property line. The centre-to-centre distance between C_1 and C_2 is 3 m. Draw the shear force diagram and determine the shear stress developed at the critical section for the connecting beam.	5	3
4A.	Determine the dimensions of components of a counterfort retaining wall that retains a backfill of height 7 m above the ground level. Density and angle of repose of the backfill soil is 18 kN/m^3 and 30° respectively. Assume SBC of foundation soil as 190 kN/m^2. Counterforts are provided at 3.5 m c/c. Coefficient of friction between soil and concrete is 0.5. Assume M30 grade concrete and Fe4 l 5 steel.	6	3
4B.	The roof of a 7 m wide hall is supported on a portal frame spaced at 4 m intervals. The continuous slab is 120 mm thick. Live load on roof= 1.5 kN/m^2. Design the slab of the portal frame. Ado t M20 grade concrete and Fe 415 steel.	4	4

5A.	Design the side walls of a 3.2 m x 3.2 m square bunker to store coal. Height of chamber is 3.3 m. Hopper bottom has a height of 1.2 m with a central hole of 0.5 m x 0.5 m. Density of coal = 8 kN/m^3, angle of repose = 30°. Adopt M20 concrete and Fe415 HYSD bars.	5	5
5B.	A cylindrical silo has an internal diameter of 6 m and 24 m deep (cylindrical portion) with a conical hopper bottom. The material stored is wheat with a density of 8 kN/m^3. The coefficient of friction between wall and material is 0.44. The ratio of horizontal to vertical pressure is 0.42. Angle of repose = 26°. Determine the hoop tension developed on the silo walls at 4 m intervals using Janssen's theory.	5	5