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 the procedure to design a portal frame as per limit state method.	4	1
1B.	Explain the difference between bunkers and silos with a neat sketch.	3	1
1C.	Determine the dimensions of 2.8 m diameter circular bunker to store 27 tonnes of coal. Density and angle of repose of coal are 9 kN/m^3 and 30° respectively.	3	5
2A.	Determine factored bending moment for an interior flat slab panel of size 7 m x 7 m with drop and panel head for a Live Load of 5 kN/m^2 and dead load due to self-weight. The slab is supported by columns of size 0.7 m x 0.7 m.	7	2
2B.	Determine the plan dimensions of a rectangular combined footing for two columns C_1 and C_2 of cross section 300 mm x 300 mm, supporting axial loads P_1 = 800 kN and P_2 = I 000 kN respectively under service axial load. The column C, 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 4 m. The allowable soil pressure at the base of the footing, 1.5 m below ground level, is 180 kN/m^2.	3	3
3A.	A cantilever retaining wall is to be designed for the following data: Height of the earth to be retained = 5 m, γsoil = 20 kN/m^3, φ = 30°, The safe bearing capacity = 220 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 2.5 m x 6.5 m is provided for two columns C_1 and C_2 of cross section 500 mm x 500 mm. The columns are connected using a beam of section 600 mm x 1000 mm. The columns C_1 and C_2 carry the factored loads of 1800 kN and 1200 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 6 m above the ground level. Density and angle of repose of the backfill soil is 16 kN/m^3 and 30° respectively. Assume SBC of foundation soil as 190 kN/m^2. Counterforts are provided at 3 m c/c. Coefficient of friction between soil and concrete is 0.5. Assume M30 grade concrete and Fe415 steel.	6	3
4B.	The roof of a 6 m wide hall is supported on a portal frame spaced at 3 m intervals. The continuous slab is 100 mm thick. Live load on roof= 1.2 kN/m^2. Design the slab of the portal frame. Adopt M20 grade concrete and Fe4 l 5 steel.	4	4

5A.	Design the side walls of a 3.5 m x 3.5 m square bunker to store coal. Height of chamber is 3 m. Hopper bottom has a height of 1 m with a central hole of 0.5 m x 0.5 m. Density of coal= 9 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 5 m and 18 m deep (cylindrical portion) with a conical hopper bottom. The material stored is wheat with a density of 9 kN/m^3. The coefficient of friction between wall and material is 0.45. The ratio of horizontal to vertical pressure is 0.40. Angle of repose = 28°. Determine the hoop tension developed on the silo walls at 3 m intervals using Janssen' s theory.	5	5