MANIPAL INSTITUTE OF TECHNOLOGY
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MANIPAL INSTITUTE OF TECHNOLOGY

SIXTH SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATION, MAY 2024

DESIGN OF REINFORCED CONCRETE STRUCTURES (CIE 4063)

(06 – 05 - 2024)

TIME: 3 HRS. **MAX. MARKS: 50**

Note: 1. Answer all questions.
2. Any missing data may be suitably assumed.
3. Use of IS 456:2000 code is permitted.

Q. NO	QUESTION	MARKS	CO	BL
1A	Explain different types of footings with neat sketch	**4**	**1**	**2**
1B	The roof of a hall is to be supported on single bay and single storey portal frames spaced at 4 m c/c. The data is given below. Height of the portal frames = 3.5m Bay width = 6m Thickness of the slab = 125mm Effective cover to the reinforcement = 25mm Live load on the roof = 2.5 kN/m^2 Grade of concrete and steel = M25 and Fe415 Design the interior slab, **check for shear and deflection not required**	**6**	**4**	**4**
2A	Details of an interior panel of a flat slab with drop is given below: Panel size = 6m × 6m. Size of drops = 3m × 3m Live load and floor finishes on the slab = 3kN/m^2 and 0.8kN/m^2 respectively Size of the supported columns = 400 mm × 400 mm Width of column strip along longer and shorter spans = 3m Thickness of solid slab and drops provided = 250mm and 100mm respectively Effective cover for slab = 30mm Grade of concrete and steel = M25 and Fe415 Check the slab for shear at critical locations and calculate the reinforcement along the shorter direction in column strip.	**8**	**2**	**3**
2B	Explain the technical differences between bunker and silo.	**2**	**5**	**2**
3	Details of a cantilever type retaining wall (with sloping face towards the earth retained) and related data is given below:	**10**	**3**	**3**

	Height of the wall = 5 m Angle of repose = 32^0 Coefficient of friction between concrete and soil = 0.5 Density of soil = 16.5 kN/m^3 Thickness of stem varies from 200mm at the top to 450mm at the junction of stem and base slab Thickness and width of base slab = 450mm and 3.2m respectively Length of toe slab = 0.9m Effective cover for all elements = 50mm SBC of soil = 180kN/m^2 Grade of concrete and steel = M25 and Fe415 Examine the stability of the retaining wall for overturning, sliding, net upward earth pressure at the base and design the stem with shear check.			
4	Details of slab and beam type combined footing provided for 2 columns are given below: Service load on column 1 of size 400mm × 400mm = 600kN Service load on column 2 of size 500mm × 500mm = 900kN SBC of soil = 200kN/m^2 Spacing of columns = 4 m c/c Effective cover = 50mm Grade of concrete and steel = M25 and Fe415 The column 1 is flushed with the property line Design the footing slab and beam **(shear reinforcement not required for beam)**	**10**	**3**	**4**
5A	A (4m × 4m) square bunker with a height of 5m, and hopper bottom of height 1.2m and opening (0.5m × 0.5m) is proposed to store food grains of density 6.5 kN/m^3 and angle of repose 22^0, assume surcharge angle equal to angle of repose. Thickness of vertical wall and hopper bottom wall = 200mm Effective cover = 30mm Determine the total capacity of the bunker and reinforcement for hopper bottom required to resist direct tension using Fe415 steel.	**5**	**5**	**3**
5B	A cylindrical silo has an internal diameter of 5m and 20m deep (cylindrical portion) with a conical hopper bottom. The material stored is wheat with a density of 8kN/m^3. The coefficient of friction between wall and material is 0.44. The ratio of horizontal to vertical pressure intensity is 0.4. Calculate the area of steel required in the side walls for direct tension if Fe415 steel, use Janseen's Theory.	**5**	**5**	**3**