MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL
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MANIPAL INSTITUTE OF TECHNOLOGY

SIXTH SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATION, 2023

DESIGN OF REINFORCED CONCRETE STRUCTURES (CIE 4063)

(/ /2023)

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	Details of an interior panel of a flat slab with drop and column head is given below: Panel size = 7m × 7m Size of drops = 3.5m × 3.5m Live load and floor finishes on the slab = $3.5kN/m^2$ and $1kN/m^2$ respectively Diameter of the supported columns = 500mm Diameter of column head = 1.5m Thickness of solid slab and drops provided = 250mm and 100mm respectively Effective cover for slab = 30mm Width of column and middle strips = 3.5m Grade of concrete and steel = M30 and Fe415 Check the slab for shear at critical locations.	5	2	3
1B	For an interior panel of a flat slab given in question (1a), calculate strip reinforcements.	5	2	3
2A	Details of a cantilever type retaining wall (with sloping face towards the earth retained) and related data is given below: Height of the wall = 5.8 m Angle of repose = 35^0 Coefficient of friction between concrete and soil = 0.45 Density of soil = 16 kN/m³ Thickness of stem varies from 180mm at the top to 500mm at the junction of stem and base slab. Thickness and width of the base slab = 500mm and 3.1m respectively Width of toe slab = 0.8m	8	3	4

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	Effective cover for all elements = 50mm Grade of concrete and steel = M30 and Fe415 Design the stem.			
2B	Discuss the practical applications of retaining walls.	2	3	2
3A	Details of slab and beam type combined footing for 2 columns is given below: Load on column 1 of size 350mm × 350mm = 750kN Load on column 2 of size 300mm × 300mm = 550kN Spacing of columns = 3.3m c/c Width of the footing = 2.5m Length of the footing = 4.7m Width of the beam = 350mm Depth of the beam = 650mm Effective cover = 50mm Grade of concrete and steel = M35 and Fe500 Boundary line is at 450mm from the centre of column 2. Calculate reinforcement for maximum bending moment of footing beam.	5	3	3

3B	Details of counterfort retaining wall and related data is given below:
	Height of the wall = 7.8m
	Base slab thickness and width = 650mm and 4m respectively
	Thickness of stem = 200mm (uniform throughout the height)
	Width of heel = 2.8m
	Effective cover for all elements = 50mm
	Angle of repose = 33^0
	Soil density = 16 kN/m^3
	Spacing of counterforts = 3.2m c/c
	Coefficient of friction between concrete and soil = 0.55
	Grade of concrete and steel = M30 and Fe415
	    i) Calculate stem reinforcement.
	    ii) Check the wall for sliding.
		5	3	3

4A	The roof of a hall is to be supported on single bay and single storey portal frames spaced at 3.5m c/c. The data is given below. Assume the columns as fixed at the ends. Height of the portal frames = 4m Bay width = 7.5m Thickness of the slab = 150mm (inclusive of 25mm effective cover to reinforcement) Live load on the roof = 2 kN/m^2 Roof and ceiling finishes = 0.5 kN/m^2 Size of the beam and column = 300mm × 420mm Effective cover for beam and column = 40 mm Grade of concrete and steel = M25 and Fe500 Analyse the portal frame for bending moments.	5	4	4
4B	Calculate the footing area and net upward soil pressure. Given are the details. Working load = 150kN	5	4	3

	Working moment = 60kNm SBC of soil = 180 kN/m^2 Size of the column = 300mm × 400mm Depth of footing = 300mm Effective cover = 50mm Grade of concrete and steel = M25 and Fe500			
5A	A (3.2mX3.2mX4.5m) square bunker with hopper bottom of height 1m and opening (0.4mX0.4m) is proposed to store cement of density 14.5kN/m^3 and angle of repose = 20^0. Thickness of vertical wall and hopper bottom wall = 300mm Effective cover = 30mm Grade of concrete and steel = M25 and Fe500 Calculate reinforcements of vertical wall of a bunker.	5	5	3

5B	For a bunker given in question (5a), calculate.
	    i) Quantity of the cement in tonnes that can be stored inclusive of surcharge up to the angle of repose.
	    ii) Reinforcement for hopper bottom required to resist direct tension.
	Grade of concrete and steel = M25 and Fe500
		5	5	3