

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code:U1601

M.E. DEGREE EXAMINATION, DEC 2025

First Semester

Structural Engineering

21PSE101 – DESIGN OF ADVANCED CONCRETE STRUCTURES

(Regulations 2021)

(Use of IS 13920:2016, IS 456:2000 and SP16 are permitted)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1. (a) For a 3.5m x 4.5m office floor, assign a two-way slab with discontinuous, easily supported edges on all sides, corners prevented from lifting, and a service live load of 4kN/m^2 . Accept the M20 and Fe415 grades. **CO2-App** (20)

Or

- (b) Under biaxial bending, design a short column with a dimension of 450 mm x 450 mm, a factored load of 1000 kN, and total factored moments of $M_{ux} = 75\text{ kNm}$ and $M_{uy} = 60\text{ kNm}$. Fe415 steel and M20 concrete are used. **CO2-App** (20)

2. (a) Design a corbel to carry a factored load of 500 kN at a distance of 250mm from the center of longitudinal reinforcement. The dimensions of the column are 300mm x 300mm. Assume flexible pads and adopt M30 and Fe415 grades. **CO5-Ana** (20)

Or

- (b) Design a shear wall of length 4.16 m and thickness is 250 mm subject to the following forces. Adopt M25 and Fe415 grades. Assume the wall is high wall. **CO5-Ana** (20)

Loading	Axial Forces (kN)	Moment (kN-m)	Shear (kN)
DL + LL	1950	600	20
Seismic load	250	4800	700

3. (a) Design the exterior panel of a flat slab floor system for a warehouse 24m x 24m divided into panels each of 6m x 6m by the columns. The live load is 5kN/m^2 and the column size is 400mm diameter. Height of floor is 3m. Use M20 grade of concrete and Fe415 grade of steel. Sketch the reinforcement details in the exterior panel of the flat slab. The design should conform to the specifications. CO4-Ana (20)

Or

- (b) Analyse and Design the simply supported rectangular slab of size 4m x 3m using yield line theory. The slab is subjected to a live load of 3.5 kN/m^2 and floor finish of 1 kN/m^2 . Use M20 grade of concrete and Fe 415 grade of steel. CO4-Ana (20)
4. (a) Determine the salient points on the stress – strain curve of concrete in bending of an unconfined concrete member if cylinder strength of concrete used f_c' is 25 N/mm^2 . If such a concrete is confined in a section of breadth 300mm, total depth 500mm and clear cover of 50mm with 10mm (78 mm^2) stirrups at 100mm centers, determine the stress – strain curve for inelastic analysis of the structures. Use the relation $f_c' = 0.8 f_{ck}$. CO4-Ana (20)

Or

- (b) A reinforced concrete slab is 150mm thick with 20mm cover to center of steel. If the positive steel reinforcement is $500\text{mm}^2/\text{m}$. Analyse and determine the approximate moment curvature and the ductility factor assuming M30 concrete and Fe250 steel for reinforcements. CO4-Ana (20)
5. (a) The following are the details of an internal beam column of type 1 joint, subjected to reversals which are not due to earthquakes. Column 600 x 600mm with 8 no's of 28mm bars, column factored load is 1500 kN, storey height is 4m, beams on either side are 400 x 500mm with 3 bars of 28mm (1846 mm^2) on the top and 3 bars of 25mm (1473 mm^2) at the bottom. Assume M30 grade of concrete and Fe415 grade of steel. Design the joint. CO3-App (20)

Or

- (b) A circular column is 350mm in diameter. Find the diameter and spacing of hoop to be used for confinement. What will be the lateral ties if the column is rectangular in cross section 550mm x 650mm. Use M20 grade of concrete and Fe 415 grade of steel. CO3-App (20)