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**Question Paper Code: U1501**

M.E. DEGREE EXAMINATION, NOV/DEC 2024

First Semester

Structural Engineering

21PSE101– DESIGN OF ADVANCED CONCRETE STRUCTURES

(Regulations 2021)

(Note: 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  $4\text{kN/m}^2$ . Accept the M20 and Fe415 grades. CO2-App (20)

Or

- (b) Design a short column under biaxial bending with the size of column is 450mm x 450mm and factored load is 1000 kN. The total factored moment is  $M_{ux} = 75\text{ kNm}$  and  $M_{uy} = 60\text{ kNm}$ . Use M20 concrete and Fe415 steel. CO2-App (20)

2. (a) Design R.C braced column 300x500mm with  $L_o$  is 9m,  $L_e$  is 6.75m has  $M_y(\text{top})$  and  $M_y(\text{bottom})$  are 70kNm and 10 kNm as ultimate moments. The axial ultimate load is 1700 kN. If the column is bend in double curvature, determine the design moments (YY is the minor axis). Adopt M40 and Fe415 grades CO5-Ana (20)

Or

- (b) 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)

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3. (a) Design a interior panel of a flat slab for a ware house of 25 m x 25 m divided into panels of 5 m x 5m. Loading class is 4kN/m<sup>2</sup>. Materials used are M25 and Fe415 bars. CO5-Ana (20)
- Or
- (b) Design a rectangular slab 6.5 m x 4.5 m in size and simply supported at edges for a service live load of 4.5kN/m<sup>2</sup>. Assume co-efficient of orthotrophy ( $\mu$ ) as 0.7. Use M20 and Fe415 grades. CO5-Ana (20)
4. (a) A reinforced concrete slab is 105mm thick with 20mm cover to center of steel. If the positive steel reinforcement is 424mm<sup>2</sup>/m. Determine the approximate moment curvature. Determine the ductility factor assuming M25 concrete and Fe250 steel for reinforcements. CO2-App (20)
- Or
- (b) State the assumptions made in the Baker's method of analysis and explain the method for a four span continuous beam with udl. CO2-App (20)
5. (a) Discuss briefly the effect of high temperature on steel and concrete and also on different types of structural members. CO2-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. CO2-App (20)