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Question Paper Code: 52162

M.E. DEGREE EXAMINATION, MAY 2016

First Semester

Structural Engineering

15PSE102 - CONCRETE STRUCTURES

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

(IS456-2000, IS875 (1-5) 1987, SP (16) - 1980, SP (34) 1987 and IS13920- 1993 are permitted)

(5 x 20 = 100 Marks)

1. (a) (i) In two - way slabs, which of the spans (longer or shorter) is taken for checking deflection? Justify your answer. (4)
- (ii) A beam width 400 mm, depth 700 mm and cover of reinforcement 40 mm is reinforced with 3 rods of 40 mm diameter. Calculate the crack width when the section is subjected to a bending moment of 450 kN-m at the following points.
 - (1) At a point on the side of the beam 150 mm below the neutral axis.
 - (2) At a point midway between bars at the tension face. Use M₂₅ grade concrete and Fe 415 steel. (16)

Or

- (b) A simply supported reinforced concrete beam of rectangular section 250mm wide by 450mm overall depth is used over an effective span of 4m. The beam is reinforced with 3 nos.20mm dia Fe415 at an effective depth of 400mm. Two hanger bars of 10mm dia. are provided. The self-weight together with dead load on the beam is 4kN/m and service live load is 10 KN/m. Using M20 grade concrete and Fe415 grade steel. Compute (a) Short term deflection (b) Long term (c) Maximum crack width at tension face directly under bar. (20)

2. (a) (i) What is the main difference between a braced wall and an un-braced wall?
(4)
- (ii) Design a corbel for a 350mm square column to support an ultimate vertical load of 600kN with its line of action 200mm from the face of the column. Use M20 grade concrete and Fe 415 grade steel.
(16)

Or

- (b) (i) Distinguish between ordinary moment shear walls and ductile moment shear walls.
(8)
- (ii) Design a reinforced concrete corbel for a $320\text{ mm} \times 320\text{ mm}$ column to support a vertical factored load of 400 kN , with its line of action 200 mm from the face of the column. Adopt M25 grade concrete and Fe415 steel bars.
(12)
3. (a) Design an interior panel of a flat slab in a building carrying a live load of 3kN/m^2 . The weight of floor finishes on the slab may be taken as 2kN/m^2 . The panel is supported on 300 mm dia. circular columns. Size of panel is $5\text{m} \times 7\text{m}$. Use M20 concrete and Fe 415 steel.
(20)

Or

- (b) (i) Write down the steps in the design for spandrel beams.
(10)
- (ii) Design the interior panel of a flat slab for a warehouse 24 m by 24 m divided into panels of $6\text{ m} \times 6\text{ m}$. Live load is 5 kN/m^2 . Adopt M15 concrete and Fe415 steel.
(10)
4. (a) A T- beam ABC is continuous over two spans of 8 m each and it carries uniformly distributed factored load of 75 kN/m . Assuming $f_{ck} = 25$ and $f_y = 500$ (with bilinear stress – strain curve) check whether we can reduce the maximum moment by 30% and redistribute the spans. Width of flange = 1000 mm , width of web = 300 mm , thickness of slab = 150 mm , $D = 800\text{ mm}$ and $d = 750\text{ mm}$ are given.
(20)

Or

- (b) (i) Write detailed notes on moment curvature relation of reinforced concrete sections.
(8)
- (ii) Design the interior panel of a flat slab for a warehouse 24 m by 24 m divided into panels of $6\text{ m} \times 6\text{ m}$. Live load is 5 kN/m^2 . Adopt M15 concrete and Fe415 steel.
(12)

5. (a) (i) Enumerate the general guidelines to be followed in the design and detailing of Reinforced concrete structures to ensure sufficient ductility. (12)
- (ii) Codal provisions of minimum dimension of RC members for fire resistance. (8)

Or

- (b) (i) What are the devices used to improve the ductility performance with seismic loading. Also mention the methods used for achieving these objectives as laid in IS-13920. (8)
- (ii) A circular column is 300 *mm* in diameter. Find the diameter and spacing of hoops to be used for confinement assuming that the concrete used is M20 and the steel is Fe 415. What will be the lateral reinforcements if the column is rectangular 600 x 500 *mm* in size? (12)
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