



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 100505

Roll No.

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B. Tech.

(SEM. V) (ODD SEM.) THEORY
EXAMINATION, 2014-15

DESIGN OF CONCRETE STRUCTURE - I

Time : 3 Hours]

[Total Marks : 100

- Note :**
- (1) Attempt all questions. All questions carry equal marks.
 - (2) Any data if missing may be assumed suitably.
 - (3) Use of IS 456-2000 is allowed.

1 Attempt any four parts of the following : **5×4=20**

- (a) What is meant by Segregation and Bleeding of concrete ? Under what circumstances, they take place.
- (b) Explain the following terms :
 - (i) Balanced section
 - (ii) Under-reinforced section and
 - (iii) Over-reinforced section
- (c) What are various design philosophies ? Explain any one of these in detail.

- (d) Explain why is the concrete cover to reinforcement required ?
- (e) Under what circumstances a doubly reinforced beam is designed ?
- (f) What is meant by limit state ? Discuss the different limit state to be considered in reinforced concrete design.

2 Attempt any two parts of the following : $10 \times 2 = 20$

- (a) Design the section of a doubly reinforced beam to resist a bending moment of 185 kN-m. The section of the beam is restricted to 350 mm \times 700 mm. Assume 50 mm effective cover. Use M_{20} grade of concrete and Fe_{415} steel.
- (b) Analyse a T-beam for the following data :
- $b_f = 1500 \text{ mm}$, $D_f = 100 \text{ mm}$, $D = 600 \text{ mm}$,
- $b_w = 300 \text{ mm}$, $f_{ck} = 150 \text{ N/mm}^2$,
- $f_y = 415 \text{ N/mm}^2$, $A_{st} = 8$ bars of 20 mm dia with effective cover 65 mm.
- (c) A cantilever beam project 2.5 m beyond the fixed end and carries a superimposed load of 10 kN/m. Design the cantilever using M_{20} grade concrete and Fe_{415} steel. Take width of support = 350 mm.

3 Attempt any two parts of the following : $10 \times 2 = 20$

- (a) Determine the shear stress in a 250 mm \times 400 mm effective depth rectangular section. If the shear force is 10 kN and torsional moment is 2 kN-m at factored loads. Assume 0.25% tension steel at the given section. State whether torsional reinforcement is required or not. Use M_{20} grade concrete and Fe_{415} steel.
- (b) A simply supported R.C. beam of size 300 mm \times 500 mm effective depth is reinforced with 4 bars of 16 mm dia. Determine the anchorage length of the bar at the simply supported end, if it is subjected to a factored shear force of 350 kN at the centre of 300 mm wide masonry support. Use M_{20} grade of concrete and Fe_{415} steel.
- (c) A simply supported R.C. Beam section 250 mm \times 500 mm effective depth is reinforced with 4 bars of 22 mm dia as tension steel. If the beam is subjected to a factored shear of 65 kN at the support. Find the nominal shear stress at the support and design the shear reinforcement. Use M_{20} grade concrete and Fe_{415} steel.

4 Attempt any two parts of the following : $10 \times 2 = 20$

- (a) What do you understand by the term "Limit state of serviceability" ? Explain the method of calculating long term deflection.

- (b) Design a R.C. slab for a room measuring $6\text{m} \times 7\text{m}$ size. The slab is simply supported on all the four edges, with corners held down and carries a super imposed load of 3500 N/m^2 , inclusive of floor finish etc. Use M_{20} grade concrete and Fe_{415} steel.
- (c) Design a simply supported roof slab for a room $7.5\text{m} \times 3.5\text{m}$ clear in size. The slab is carrying an imposed load of 5 kN/m^2 . Use M_{20} grade concrete and Fe_{415} steel.

5 Attempt any two parts of the following : $10 \times 2 = 20$

- (a) What are interaction curves ? Explain the failure of a column subjected to compression and uniaxial bending with the help of interaction curve.
- (b) Design a reinforced concrete square column of 500 mm side to carry an ultimate load of 2000 kN at an eccentricity of 180 mm . Use M_{20} grade concrete and Fe_{415} steel.
- (c) A circular R.C.C. column of 450 mm dia is reinforced with 8 bars of 18 mm dia and are tied together with helical reinforcement of 8 mm dia at a pitch of 60 mm c/c . Find load carrying capacity of the column, when effective length of column is 4.5 m . Take clear cover to helical reinforcement 50 mm . Use M_{20} grade concrete and Fe_{415} steel.