

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]

Dec.-22-0175

CE-501 (Limit State Design of Concrete Structures-I)

B.Tech. 5th (CBCS)

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five questions in all, selecting one question from each Sections A, B, C and D. Section E is compulsory. Relevant codes are allowed. Assume any missing data.

SECTION - A

1. (a) Discuss the merits and demerits of the ultimate load method. (10)
- (b) Differentiate between Working stress method and Limit state design. Discuss theories in detail. (10)
2. Design a concrete mix for use in reinforced cement concrete work from the following data using BIS method: (10)
 - (i) Characteristic strength at 28-days = 40 N/mm².
 - (ii) Type of cement = 43 grade ordinary Portland cement.
 - (iii) Slump required = 100 mm, exposure = Severe.
 - (iv) Maximum nominal size of aggregate = 20 mm.
 - (v) Specific gravity of coarse aggregate = 2.74.
 - (vi) Specific gravity of fine aggregate = 2.74.
 - (vii) The fine aggregate corresponds to grading zone I.

SECTION - B

3. Design a rectangular beam for an effective span of 6 m. The superimposed load is 80 kN/m² and size of the beam is limited to 30 cm × 70 cm overall. Use M 20 Mix and Fe 415 grade steel. Assume any missing data. (10)
4. Design a two-way slab for a room 5.5 m × 4.0 m clear in size if the superimposed load is 5 kN/m². Use M 15 mix and Fe 415 grade steel. If, edges simply supported-corners not held down. Assume any missing data. (10)

SECTION - C

5. Discuss the relevance of the concept of shear and torsion in reinforced concrete design. Also describe in detail the various provisions and code specifications for their design. (10)
6. A Reinforced Concrete beam has an effective depth of 500 mm and a breadth of 350 mm. It contains 4-25 mm bars. If (i) $\sigma_{ck}=15 \text{ N/mm}^2$ and $\sigma_{sv}=250 \text{ N/mm}^2$, and (ii) $\sigma_{ck} = 15 \text{ N/mm}^2$ and $\sigma_{sv} = 415 \text{ N/mm}^2$, calculate the shear reinforcement needed for a factored shear force of 350 kN. (10)

SECTION - D

7. What do you mean by a tread riser staircase? List out the steps for design. Draw a sectional elevation of this staircase showing the different reinforcements needed. (10)
8. Design the reinforcement in a spiral column of 400 mm diameter subjected to a factored load of 1500kN. The column has an unsupported length of 3.4 m and is braced against sideways. Use M 25 concrete and Fe 415 steel. (10)

[P.T.O.]

SECTION - E

9. (a) What is the modular ratio in limit state design?
- (b) What is the value (maximum and minimum) for depth of neutral axis for Fe 250, Fe 415 and Fe 500?
- (c) Define creep along with its significance.
- (d) Define slenderness ratio of a compression member and discuss its implications.
- (e) Define Modulus of rupture.
- (f) What do you understand by Nominal shear stress?
- (g) Define Shear strength and Torsional strength.
- (h) Write the corresponding value of Euler's critical load when a column is fixed at both ends.
- (i) What are the requirements for lateral ties in reinforced sections?
- (j) Define bond stress and give the expression for the same.

(10×2=20)