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6E6034

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B. Tech. (Sem. VI) (Main & Back) Examination, April-May - 2018
Civil Engineering
6CE4A Design of Concrete Structures - I

Time : 3 Hours]

[Total Marks : 80
[Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. <u>IS : 456-2000</u>   2. <u>NIL</u>

UNIT - I

1   (a)   Explain various methods used for the design of R.C.C. structures including their merits and demerits.

4

(b)   An R.C.C. beam 300 mm × 640 mm overall is reinforced with 4 bars of 20 mm diameter. The beam has to carry a superimposed load of 50 kN/m, including the self weight of the beam, over an effective span of 4m. Find the actual stress developed in steel and concrete. The effective cover is 40 mm. Take M = 13.33.

8

(c)   Describe the different types of R.C.C. beam sections and their various features with the help of neat sketches.

4

OR

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1

[P.T.O.

1   (a)   Brief the safety and serviceability requirements as per IS recommendation.

                                                                                    2

    (b)   Show the stress-strain relationship curve for concrete and mild steel. Also explain this behaviour.

                                                                                    2

    (c)   A beam, simply supported over an effective span of 7m carries a live load of 20 kN/m. Design the beam, using M20 concrete and Fe 415 grade steel bars. Keep the width equal to half the effective depth. Assume unit weight of concrete as 25 kN/m^3.

                                                                                    12

UNIT - II

2   (a)   Define the following terms :
          (i)   Limit state
          (ii)   Characteristic load
          (iii) Characteristic strength
          (iv)   Design values
          (v)   Partial safety factors
          (vi)   Factored load
          (vii) Moment of Resistance.

                                                                                    6

    (b)   A concrete beam has 350 mm breadth and 700 mm effective depth. Design the beam if it is subjected to a superimposed bending moment of 350 kN-M.

          Use HYSD bars of Fe415 grade and concrete of M20 grade. Take $d' = 50$ mm. Also draw the stress block diagram for this beam section.

                                                                                    10

                                   OR

2   (a)   What is a doubly reinforced T-beam. Derive the expressions for finding moment of resistance for doubly reinforced T-beam.

7

      (b)   Design the T-beam having following data :
Width of flange = 750 mm, breadth of beam = 250 mm Effective depth = 500 mm, Thickness of flange = 90 mm, applied moment = 230 kN-m. Use M20 concrete and Fe415 steel.
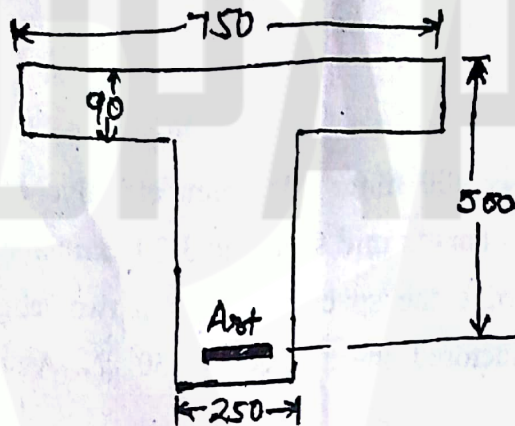

Fig. 1

9

UNIT - III

3   (a)   Write short notes on :
(i)   Diagonal tension
(ii)   Types of shear reinforcement
(iii)   Concept of bond stress
(iv)   Anchoring bars.

6

      (b)   A simply supported beam, 280 mm wide and 450 mm effective depth carries a uniformly distributed load of 50 kN/m, including its own weight over an effective span of 6m. Design the shear reinforcement in the form of vertical stirrups. Assume that the beam contains 0.75% reinforcement throughout the length. The concrete is of M20 grade and steel for stirrups is of Fe250 grade. Take width of support as 400 mm.

10

OR

6E6034]   3   [P.T.O.

3 (a) Write short notes on :
   (i)   Splicing of bars
   (ii) Curtailment of bars
   (iii) Bond
   (iv) Bent up bars.

6

   (b) An RC beam is 200 mm × 450 mm effective depth is reinforced with 6-20 mm Fe415 bars at mid span and 3-20 mm bars are curtailed at support section. Determine the spacing of 8 mm two legged stirrups at support section for a factored shear force of 150 kN. Assume M20 mix and for steel stirrups.

10

UNIT - IV

4 (a) Explain the difference between one way slab and two way slab.

2

   (b) A simply supported slab of a corridor of a hospital building has a clear span 2.5 m and is supported on beams 230 mm width. Design the slab, if the beam is carrying a live load of 5 kN/m^2. Use M20 concrete and HYSD Fe415 bars. Assume suitable data if required.

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OR

4. Design an R.C. slab for a room measuring 5m × 6m size. The slab is simply supported on all the four edges, with corners held down and carries a super-imposed load of 3000 N/m², inclusive of floor finishes etc. Use M20mix, Fe415 steel and IS code method. Also check for shear and development length. Draw the detailing of reinforcement.

16

UNIT - V

5. (a) What are interaction curves ? Explain the failure of a column subjected to compression and uniaxial bending with the help of an interaction curve.

8

(b) Design a circular column with helical reinforcement to carry an axial load of 1000 kN. Use M20 concrete and Fe415 steel. Assume suitable data.
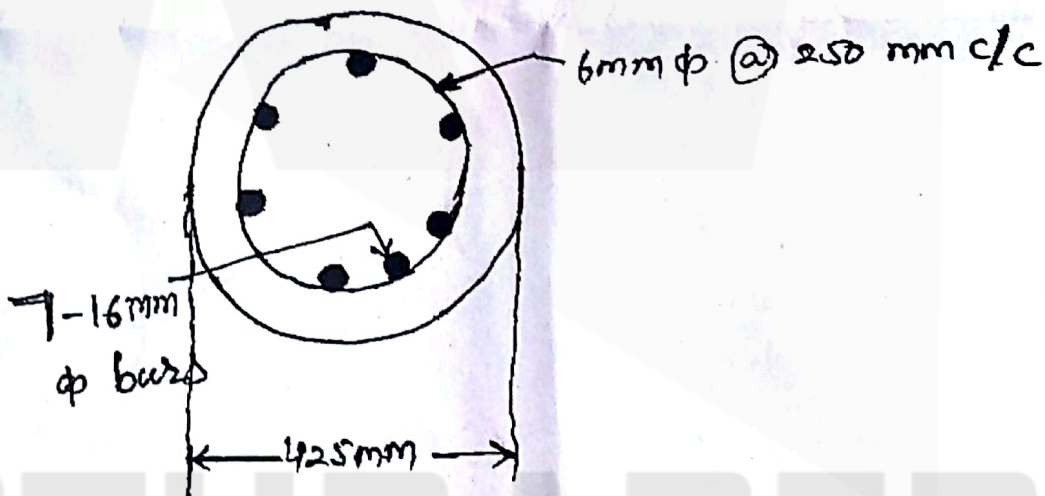

6mm φ @ 250 mm c/c

7-16mm φ bars

425mm

Fig. 2

8

OR

5   (a) Write the design steps for Isolated Rectangular column footing in detail, Also show various checks.

8

    (b) Design a combined footing for two columns 500 mm × 500 mm each, 5m apart carrying a load of 1600 kN. Available width restriction is 2.4 m. The safe bearing capacity is 200 kN/m^2. Use M25 concrete and Fe415 steel. Assume suitable data if required.

8

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