2016

STRUCTURES-V

Paper : ENG-5·5

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Question no. **1** is **Compulsory** and answer **any four** from the rest.

1. (i) Steel is an alloy of   2×10=20

    (a) Iron

    (b) Carbon

    (c) both (a) and (b)

    (d) None of these

(ii) The dead load on structures are

    (a) Wind load

    (b) Snow load

    (c) Permanent load

    (d) All of these.

(iii) The diameter of longitudinal bars of a column should never be less than

    (a) 6 *mm*

    (b) 12 *mm*

    (c) 8 *mm*

    (d) 10 *mm*

(iv) The minimum depth cover in *mm* to ties in column shall be

    (a) 40

    (b) 60

    (c) 80

    (d) None of these.

(v) As per IS : 456, the reinforcement in a column should not be less than —

    (a) 0·5% of cross-sectional area

    (b) 0·6% of cross-sectional area

    (c) 0·7% of cross-sectional area

    (d) 0·8% of cross-sectional area.

(vi) The maximum ratio of span to depth of a simply supported slab with mild steel reinforcement and spanning in two direction is

    (a) 25

    (b) 30

    (c) 35

    (d) 40

(vii) In the design of a footing, the self weight of footing including backfill of soil is generally assumed as

    (a) 5 to 10% of axial load

    (b) 10 to 20% of axial load

    (c) 20 to 30% of axial load

    (d) 30 to 40% of axial load.

(viii) T-beams behave as a rectangular beam of width equal to its flange of its neutral axis is

   (a) remains within the flange

   (b) remains below the slab

   (c) below the geometrical centre of the web

   (d) coincides with the geometrical centre of the web.

(ix) The shape of a column should be

   (a) Circular

   (b) Square

   (c) Rectangular

   (d) All of these

(x) The weight of cement concrete is

   (a) 10,000 N/m^3

   (b) 38,000 N/m^3

   (c) 34,000 N/m^3

   (d) None of these.

2. *(a)* Write down the I.S. recommendations regarding longitudinal reinforcement in a column.

   (b) Write in brief the philosophy of limit state design.

                             10+10=20

3. *(a)* What are dead load and wind load ?

   (b) A reinforced concrete beam is supported on two walls of 500*mm* thickness each, at a clear spacing of 4·5*m*. The beam carries a superimposed load of 8·2 *kN/m* including its self-weight. Using *M*-15 and *Fe*-250 steel, design the section. Also draw a neat sketch.

                             5+15=20

4. *(a)* Design the classification of columns according to materials of construction and shape of column.

   (b) Design a short column having an axial load of 1500*kN*. Using *M*-25 grade of concrete and *Fe*-415 HYSD bars.

                             10+10=20

5. (a) What is water-cement ratio ? What is its relation to workability of concrete ?

(b) Design a singly reinforced beam having a clear span of 4·0m. The beam carries a uniformly distributed load of 8 kN/m including its own weight. Use M-15 grade of concrete and Fe-415 grade of steel. Draw neat sketches of longitudinal section and cross-sections at mid-span and at support.

5+15=20

6. (a) Explain briefly what do you understand by working stress method of design.

(b) Design a simply supported slab having a size of 3·0m × 7·0m and resting on a wall of width 250mm. Use M-15 grade of concrete and Fe 415 grade of steel. Also draw the reinforcement arrangements in plain and elevation.

5+15=20

7. (a) What are the basic components of reinforced cement concrete ? Discuss its advantages over other materials of construction.

(b) Design a rectangular column footing for carrying an axial load of 600kN for a column having base size of 400mm×600mm. The safe bearing capacity of the soil is to be taken as 120 kN/m^2. Use M-20 grade of concrete and Fe-415 grade steel. Draw longitudinal section showing all dimension and reinforcement details.

5+15=20

———————