Printed Pages : 4

ECE-505

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

PAPER ID : 100505

Roll No.

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 : 10×2=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 × 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 :

$b_f = 1500\ mm$, $D_f = 100\ mm$, $D = 600\ mm$,

$b_w = 300\ mm$, $f_{ck} = 150\ N/mm^2$,

$f_y = 415\ N/mm^2$, $A_{st} = 8$ 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 : 10×2=20

(a) Determine the shear stress in a 250 mm × 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 × 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 masonary support. Use M_{20} grade of concrete and Fe_{415} steel.

(c) A simply supported R.C. Beam section 250 mm × 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 : 10×2=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 6m × 7m 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 7.5m × 3.5m clear in size. The slab is carrying an imposed load of 5 kN/m^2. Use M_{20} grade concrete and Fe_{415} steel.

Attempt any two parts of the following : 10×2=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.