Question Paper Code : 10229

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Fifth Semester

Civil Engineering

CE 2306/CE 55/CE 1302/10111 CE 506 — DESIGN OF RC ELEMENTS

(Regulation 2008)

Time : Three hours Maximum : 100 marks

IS 456-2000 and SP 16 Design charts and Tables are permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How are the safety margins assigned in Elastic method and ultimate load method?

2. Calculate the limiting value of tensile stress in an uncracked section of a flexural member made with M25 grade of concrete.

3. List the factors that influence the moments developed in two-way rectangular slabs.

4. Mention any two advantages of introducing compression steel in reinforced concrete beams.

5. Why is bond stress more in compression bars than that in tension bars?

6. How is the reinforcement designed and provided in a rectangular beam when the equivalent torsion M_t exceeds the design bending moment M_u?

7. Distinguish between braced and unbraced columns.

8. Name any two methods used for design of long columns.

9. How is the main steel distributed in wall footings and two-way rectangular footings?

10. What are the factors that influence the selection of number of lifting and hoisting locations of a long beam during its erection process?

PART B — (5 × 16 = 80 marks)

11. (a) Design a rectangular RC beam in flexure and shear when it is simply supported on masonry walls 300 mm thick and 5m apart (centre to centre) to support a distributed live load of 8 KN/m and a dead load of $6KN/m$ in addition to its own weight. Materials used are M20 grade of concrete and Fe415 steel bars. Adopt working stress method of design.

Or

(b) Design the roof slab for a Hall of size 4m × 10m by working stress method using M20 concrete and Fe 415 steel. The slab is simply resting on 230 mm thick brick walls all around. Take the live load on the slab as 1.5 kN/m² and finish load as 2.25 kN/m².

12. (a) Design the reinforcements required in a simply supported RC slab for a floor to carry a live load of 5 KN/m² (at service state). The clear dimension of the room is 5m × 8m with 300 mm walls all round. Assume a floor finish of 1.5KN/m². Materials used are M20 grade concrete and Fe415 steel bars. Adopt limit state method.

Or

(b) Calculate the ultimate moment of resistance of a singly reinforced T beam having flange width of 1200 mm, flange thickness of 120 mm and rib width of 300 mm. The effective depth of beam is 600 mm. The beam is reinforced with 8 numbers of 25 mm diameter Fe415 steel bars. The grade of concrete is M20.

13. (a) A rectangular beam 350 mm wide and 550 mm effective depth is reinforced with 4 number of 25 mm bars as main tension steel. Two of its four main bars are symmetrically bent at the ends of the beam at 45°. Find the stirrups required for resistance against shear failure at the ends, if the factored shear force at the critical section is 250 kN. Assume M25 grade of concrete and Fe415 steel bars.

Or

(b) Design the transverse reinforcement using 2-legged stirrups of 10 mm diameter for the following data :

Size of the beam : 300 mm × 600 mm

Factored torsion : 45 KN-m

Factored shear : 95 KN

Tension reinforcement : 4 number of 20 mm diameter; Reinforcement on compression face : 2 number of 12 mm diameter clear cover on all four sides (beyond the stirrups) : 15 mm materials used : M20 grade of concrete and Fe415 steel bars.

14. (a) Design the longitudinal reinforcement in a short column 400 mm × 600 mm subjected to an ultimate axial load of 1600 kN together with ultimate moments of 120 kN-m and 90 kN-m about the major and minor axis respectively. The reinforcements are distributed equally on all four sides. Adopt M20 grade concrete and Fe 415 steel bars.

COLUMN

Or

(b) Design the reinforcements in a circular column of diameter 350 mm with helical reinforcement of 8 mm diameter to support a factored load of 1400 kN. The column has an unsupported length of 3.5 m and is braced against side sway. Adopt M20 grade concrete and Fe415 steel bars.

15. (a) Draw the shear force and bending moment diagrams and design the 20 mm diameter bars as top steel for maximum hogging moment for a RC rectangular combined footing using the following data :

FOOTING

Centre-to-centre distance between columns : 4m. Each column is square in shape with 400 mm side. Each column carries an axial load at service state = 1,200 kN. The projection of footing parallel to the length beyond the axis of each column is 1m.

The limiting bearing capacity of soil : 440 kN/m^2.

Materials used : M20 grade concrete and Fe415 steel bars.

Or

(b) Sketch the standard detailing of the following :

(i) Two span one-way continuous slab with curtailment details. (8)

(ii) Curtailment details in a tapered cantilever beam. (8)

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