[01 – 3110]

III/IV B.E. DEGREE EXAMINATION.

First Semester

Civil Engineering

REINFORCED CONCRETE STRUCTURES — I

(Common with Civil Environmental and Dual Degree in Civil Engineering)

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

Any data missing may be assumed suitably.

Use of IS 456-2000 is allowed.

1. (a) What are the advantages of adopting limit state method of design over working stress method of design?

(b) Mention the situations where the doubly reinforced sections are to be adopted.

(c) Differentiate between Flexural bond stress and anchorage bond stress.

(d) Explain the difference in the behavior of one way and two way slabs.

(e) Differentiate between short and long columns.

(f) Explain what is meant by tension failure of columns.

(g) What is meant by punching shear? Suggest suitable reinforcement details for resistance against it.

2. (a) Estimate the stress block parameters in limit state method.

(b) A singly reinforced concrete beam having a width of 250 mm is reinforced with steel bars of area 3600 mm^2 at an effective depth of 400 mm. Compute the limiting moment of resistance of beam. Adopt M20 grade concrete and Fe 415 grade steel.

3. (a) Determine the ultimate moment of resistance of the T-beam section with effective width of flange 1050 mm, width of rib 250 mm, effective depth of the beam 540 mm, thickness of flange 120 mm and area of steel of 2250 mm^2. Use M20 grade concrete and Fe 415 grade steel.

(b) A simply supported reinforced concrete beam of size 300 mm × 500 mm effective depth is reinforced with 4 bars of 16 mm dia of Fe415 grade. Determine the anchorage length of the bars at the simply supported end if it is subjected to a factored shear force of 350 kN at the centre of 300 mm wide masonry support. The concrete mix is of M20 grade.

4. A simply supported reinforced concrete beam of clear span of 7.6 m has a cross section of size 200 mm × 500 mm effective depth. It is reinforced with 5 bars of 16 mm ϕ on the tension side. The beam carries a uniformly distributed service load of 20 kN/m including its own weight. Determine

(a) The length over which vertical stirrups are to be designed and their spacing and

(b) Spacing of stirrups when 3 bars are bent up at the same section.

5. (a) Briefly explain the design of one way slab as per IS code provisions.

(b) The floor slab of a room with internal dimensions of 5.5 m × 4 m is to carry a live load of 2 kN/m^2 and dead load due to flooring, finishing and partitions of 1.5 kN/m^2. Design the slab if it is, simply supported on all four edges when the corners are held down. Use M20 grade concrete and Fe415 grade steel.

6. Design a R.C. circular column section to carry a factored load of 2400 kN. Provide helical reinforcement as transverse reinforcement. Use M20 grade concrete and Fe 415 grade steel.

7. Design a sloping footing for a reinforced concrete column of size 500 mm × 500 mm transmitting an axial service load of 2000 kN. The safe bearing capacity of the soil at the site is 200 kN/m^2. Use M20 grade concrete and Fe 415 grade steel.

8. (a) Calculate the design constants for a balanced singly reinforced beam in working stress method when the permissible stresses in concrete and steel are 5 N/mm^2 and 230 N/mm^2 respectively.

   (b) The cross section of an R.C.C beam of rectangular section is to be designed to resist a B.M of 65 kN.m. Assuming the width of beam as half the effective depth, determine the dimensions of the beam and the area of tension reinforcement for the balanced section. Use M 20 grade concrete and Fe 415 grade steel. Adopt working stress method.
