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Reg. No. : .....

Name : .....

First Semester M.Tech. Degree Examination, February 2015
(2013 Scheme)
Civil Engineering
Stream : Structural Engineering
CSC1002 : ADVANCED THEORY AND DESIGN OF RC STRUCTURES

Time : 3 Hours Max. Marks : 60

Instructions : *1) Answer **any two full** questions from **each** Module.*
*2) **Use** of IS 456 and SP-16 **permitted**. Assume any missing data **wherever** necessary.*

MODULE – I

1. a) Explain the stress strain characteristics of concrete under uniaxial and multi axial states of stress. 4

   b) Discuss "concrete confinement by reinforcement and effect of spacing of transverse steel on efficiency of confinement". 3

   c) A T beam section has a flange width of 1100 mm, flange thickness of 110 mm, a rib of 230 mm width and an effective depth 550 mm. It is provided with a tension reinforcement of area 3780 mm^2. Find the ultimate moment carrying capacity of the section. Use M_{20} concrete and Fe 415 steel. 3

2. a) What are short term and long term deflections ? Why is it necessary to limit deflections in reinforced concrete flexural members ? 4

   b) Estimate the deflection of a simply supported rectangular RCC beam 300 × 560 mm having an effective span of 5.00 m subjected to a maximum bending moment of 140 kNm, of which 65% is due to permanent loads. Assume tension steel of 1.2%, compression steel of 0.40%, cover to center of steel is 40 mm, creep factor = 1.5 shrinkage strain = 0.00031, grade of concrete M_{20}, grade of steel Fe415. 6

P.T.O.

3. a) A simply supported reinforced concrete beam of rectangular section 250 mm wide 450 mm overall depth is used over an effective span of 4 m. The self-weight together with dead load on the beam is 4kN/m and service live load is 10 KN/m. Using M_{20} grade concrete and Fe 415 grade steel compute maximum crack width at tension face. The beam is reinforced with 3 nos. of Fe415 at an effective depth of 400 mm. Two hanger bars of 10 mm dia are also provided. **6**

   b) Briefly describe the mechanism of flexural cracking and how it is controlled in the design. **4**

MODULE – II

4. a) Explain the differences between ordinary RCC wall and shear wall, with sketches. **4**

   b) A reinforced concrete grid floor is to be designed to cover a floor area of 12 m × 18 m with the ribs spaced at 1.4 m c/c. both ways. Live load on the floor is 2.0 kN/m^2. Use M_{20} concrete and Fe 415 grade steel. **6**

5. a) Describe how the load is carried by a corbel. Sketch the equilibrium forces in a corbel assuming the depth of neutral axis at one-half the depth. **4**

   b) A corbel is to be attached to an RC column of size 250 × 400 mm at its shorter side. The corbel is to carry a factored load of 400 kN at a distance of 200 mm from the face of the column. Design the corbel using M_{25} concrete and Fe415 steel. Sketch the reinforcement detailing. **6**

6. a) Explain the structural behaviour of a simply supported deep beam carrying a UDL with sketches. Also sketch the provision of reinforcement detailing of a continuous deep beam. **4**

   b) A single span deep beam has an overall depth of 3.8 m and an effective span of 5.80 m. The width of the beam is 400 mm. The beam supports a uniformly distributed live load of 460 kN/m, over the entire span. Design the beam using M_{25} concrete and Fe415 steel. **6**

MODULE – III

7. a) Explain the concept of Strip method of analysis of slabs. 4

   b) Sketch the yield line pattern for the following under UDL.

      i) Circular slab with edges fixed.

      ii) Rectangular slab with two adjacent edges fixed and the other 2 edges supported on a corner column without any edge beam. 3

   c) Derive the expression for ultimate moment for an isosceles triangular slab isotropically reinforced carrying a uniform area load. The slab is free at the longer edge and simply supported at the other edges. 3

8. a) Discuss the advantages and applications of strut and tie models in concrete structures. 4

   b) The following are the details of an internal beam column joint subjected to mild reversals which are not due to earth quake.

      Column 600 × 600 mm with 8 nos-25 mm dia bars.

      Column factored load = 1600 kN.

      Storey height = 3.2 m.

      Beams on either side are 400 × 500 mm with 3 nos. of 20 mm dia on the top and 3 nos. of 25 mm dia at bottom. Assuming fck = 25 kN/mm^2 and fy = 415 N/mm^2, design the joint. 6

9. a) Discuss the need of moment redistribution in continuous beams. 4

   b) A continuous beam with two equal spans of 5.6 m each, the beam being supported on masonry walls of 300 mm thickness. Beams are placed at 3 m c/c, to support a floor of 150 mm thickness supporting a live load of 3.50 kN/m. Draw the moment envelopes of the bending moments as per IS code recommendations for moment redistribution. 6