



Reg. No. : .....

Name : .....

**First Semester M.Tech. Degree Examination, March 2013**  
**(2008 Scheme)**  
**CIVIL**  
**Structural Engineering**  
**CSC 1002 : Advanced Theory and Design of RC Structures**

Time: 3 Hours

Max. Marks: 100

**Instructions : Answer any five questions.**

**Use of IS 456-2000 and SP 16 codes are permitted.**

- I. a) Explain strength and serviceability method of design of reinforced concrete structures. 7
- b) A doubly reinforced beam of cross section 300 mm × 500 mm with 4 numbers of 22 mm diameter rods as compression steel at 25 mm clear cover and 3 numbers of 28 mm diameter rods as tension steel at 30 mm clear cover. Assuming  $M_{20}$  concrete and  $Fe_{415}$  steel. Compute the stresses in concrete and steel under a science load moment of 150 kN/m. 13
- II. a) Why does the code impose minimum and maximum limits for :
- i) Percentage area of flexural reinforcement
- ii) and spacing of the reinforcement. 8
- b) Design a rectangular beam which supports uniformly distributed load of 40 kN/m over a clear span of 5.5m. In addition to this the beam carries two concentrated loads of 10 kN each at a distance of 1.5m from the face of the support. The size of the beam is restricted to 400 mm × 900 mm. Use  $M_{20}$  grade concrete and  $Fe_{415}$  for steel. 12
- III. a) Why does the code require all columns exists is able to resist a minimum eccentricity of loading ? 7
- b) Design the reinforcement in a column of size 400 mm × 600 mm subjected to a factored axial load of 3000 kN. The column has an unsupported length of 3m and is braced against side way in both directions. Use  $M_{30}$  concrete and  $Fe_{415}$  steel. 13



- IV. a) Distinguish between short term deflection and long term deflection. 6
- b) A rectangular beam  $300 \times 700$  mm effective depth is reinforced with  $3800 \text{ mm}^2$  on tension side and  $950 \text{ mm}^2$  on compression side. Check the deflection requirements for the beam according to IS 456-2000. Assume the simply supported span of 12m. Use  $M_{20}$  concrete and  $Fe_{415}$  steel. 14
- V. a) Explain about the type of reinforcement provided in deep beams. 6
- b) Determine the thickness and reinforcement for a simply supported transfer girder of length 5m loaded from two columns at 1.6m from each end with  $4 \times 10^3$  kN. The total depth of beam is 4m and width of supports is 450mm. Assume  $M_{40}$  concrete and  $Fe_{415}$  steel. 14
- VI. Write short notes on **any four** :
- List out the factors influencing crack widths in flexural members.
  - What is meant by moment redistribution and what are the advantages of this in design ?
  - Briefly explain the structural failure of World Trade Centre.
  - Space truss analogy of shear resisting mechanism.
  - Discuss the failure modes eccentric compression members. (4×5=20 Marks)
-