



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

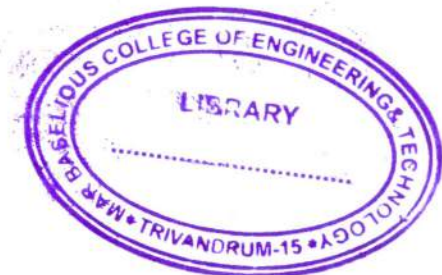
Time : 3 Hours

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 mm². Find the ultimate moment carrying capacity of the section. Use M₂₀ 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 M₂₀, 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 \times 18 m with the ribs spaced at 1.4 m c/c. both ways. Live load on the floor is 2.0 kN/m². 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 \times 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 $f_{ck} = 25 \text{ kN/mm}^2$ and $f_y = 415 \text{ N/mm}^2$, 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

