

**CV506**

USN 1 M S

**M S RAMAIAH INSTITUTE OF TECHNOLOGY**

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE - 560 054

**SEMESTER END EXAMINATIONS - JANUARY 2016**Course & Branch : **B.E.- Civil Engineering**Semester : **V**Subject : **Design of RC Elements**Max. Marks : **100**Subject Code : **CV506**Duration : **3 Hrs****Instructions to the Candidates:**

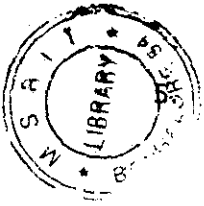
- Answer **one** full question from each unit.
- Assume missing data suitably.
- IS 456:2000 and SP 16 charts are allowed.

**UNIT - I**

- Discuss the necessity of doubly reinforced beam in practice. CO1 (05)
  - A rectangular beam of cross section 325mm×700mm. It is provided with 6-20Ø as tension reinforcement and use 2L#10Ø @ 175 c/c as stirrup reinforcement. Calculate Moment of Resistance at collapse, Compression and Tensile forces and Lever arm. The beam is SS over a effective span of the beam is 10m. Calculate the safe concentrated load acts at 1/3<sup>rd</sup> span from either supports. Use M<sub>35</sub> grade concrete and Fe550. Assume severe exposure condition. CO1 (15)
- Why steel is considered as the best material for reinforcement in RCC. CO1 (05)
  - The cross sectional dimension of a doubly reinforced beam is 300mm×700mm. The tension and compression reinforcement is 4#25Ø and 2#25Ø respectively. Determine the ultimate moment of resistance at collapse. Assume M<sub>20</sub> grade concrete and CWD bars with mild exposure. use 2L#8Ø @ 150 c/c as stirrup reinforcement. CO1 (15)

**UNIT - II**

- A simply supported beam of dimensions 300 × 600 mm is carrying a dead load of 20kN/m and Live load of 10kN/m over an effective span of 8.3m. The beam is reinforced with 5 numbers of 20mm dia. HYSD bars on tension side. The grade of concrete is M<sub>25</sub>. Exposure is Moderate. Assume 8mm Ø stirrups. Calculate the short term deflection and also find the approximate long term deflection. CO2 (20)
- A rectangular SS beam is of effective span 6m and of overall size 325mm×675mm. It is reinforced with 5#25Ø on the tension side. Superimposed load on the beam is 24kN/m (Including Self Wt.) and central concentrated load of 21kN is acting on the beam. Determine the surface crack widths at the following points. CO2 (20)
  - Bottom corner of the beam
  - Below the centre of intermediate reinforcement
  - Below the centre between two barsGrade of concrete = M<sub>35</sub>  
Grade of steel = Fe 500 & Assume Effective cover = 75mm.

**UNIT - III**

A T beam floor slab of RCC has 120mm thick slab forming part of T beam. Which are of 10.5m clear span. The end bearings are 250mm thick. Spacing of T beams is 3.5m. The service live load on the floor is  $4.5\text{kN/m}^2$ . Account for floor finishes and light partitions. Adopt  $M_{40}$  concrete and Fe550 steel and the exposure is Extreme. Width of rib is restricted to 325mm. Design an intermediate T beam. Sketch the details. CO3 (20)

6. A beam of width 300mm is subjected to a factored moment of 90kNm, a factored shear force of 95kN and ultimate torsional moment of 70kNm. The effective span of the beam is 6m. Condition of exposure is moderate. Characteristic strength of concrete and steel are  $M_{30}$  and Fe415. Assume 10mm  $\varnothing$  stirrups. Sketch the reinforcement details. CO3 (20)

**UNIT - IV**

7. The slab of a residential building of size  $4.3\text{m} \times 6\text{m}$  is simply supported on all the four sides on 230mm walls and the corners are free to lift. Assuming an imposed load of  $2\text{kN/m}^2$  and load due to finishes of  $1\text{kN/m}^2$ . Use  $M_{25}$  concrete and Fe 415 steel. Design the floor slab. Assume mild exposure condition. Sketch the details. CO4 (20)

8. Design a doglegged staircase for a public building considering a service LL of  $5.5\text{kN/m}^2$ . The size of the staircase room is  $2.6\text{m} \times 5.4\text{m}$ . Vertical distance between floors is 3.3m. Assume that the landing is supported only on the edge perpendicular to the risers. Use  $M_{20}$  concrete and Fe 500 steel. Take rise = 150mm and Tread = 300mm. Assume moderate condition and sketch the details. CO4 (20)

**UNIT - V**

9. A square column 400mm size with 8# 20 mm diameter transfers Dead load of 1200kN and Live Load of 800kN to the footing. SBC of soil is  $400\text{kN/m}^2$ . Design the square footing to support the column using  $M_{20}$  concrete and Fe 415 steel. Assume clear cover as 40mm and sketch the details. CO5 (20)
10. a) Explain the functions of lateral reinforcement in RCC column CO5 (05)  
b) Distinguish between short and slender column CO5 (05)  
c) Design an axially loaded short rectangular column of size  $450\text{mm} \times 600\text{mm}$  and having 3m unsupported length. The column is subjected to a service load of 2200kN and is effectively held in position but not restrained against rotation. Adopt  $M_{25}$  concrete and Fe 500 steel. Assume severe condition and sketch the details. CO5 (10)

\*\*\*\*\*