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# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## February / March 2023 Semester End Main Examinations

**Programme: B.E.** **Semester: V**
**Branch: Civil Engineering** **Duration: 3 hrs.**
**Course Code: 20CV5PCDRC** **Max Marks: 100**
**Course: Design of RCC Structural Elements and CAD Lab** **Date: 09.03.2023**

**Instructions**: 1. Answer 5 full questions internal choice is given in unit 1 and 3.
2. Use of IS 456 2000 and only SP 16 charts for column design is permitted.
3. Assume missing data suitably and clearly state them.





### UNIT - I

1 a) Explain why the loads are over estimated and strength is under estimated in design. **08**

b) Clearly distinguish between balanced, under reinforced and over reinforced sections with the help of sketches. **06**

c) Obtain an expression for the limiting depth of neutral axis ($x_{u,\ limit}$) for a rectangular section with M20 concrete and Fe-500 grade of steel. **06**

**OR**

2 a) A cantilever beam of span 4m and cross section 230 x 500 mm is reinforced with 4 - # 20 on tensile side and 2 - # 16 on compression side with an effective cover of 40mm. Calculate the maximum udl than can be allowed on the beam. M20 grade of concrete and Fe-415 grade of steel are used. **08**

b) Calculate the moment of resistance of a T-section with the following details: **12**

- Effective flange width = 2300 mm
- Depth of flange = 150 mm
- Width of rib = 300 mm
- Effective depth = 700 mm
- Reinforcement = 8 - # 25
- Materials: M20 concrete and Fe-415 steel

### UNIT - II

3 A rectangular cross section beam is simply supported over a clear span of 5 m and width of each support is 230 mm. It carries a load of 20 kN/m apart from its self-weight. Design the beam for both flexure and shear adopting M25 concrete and Fe500 steel. **20**

### UNIT - III

4 a) Distinguish between one-way and two-way slabs. **04**

b) Design a RCC slab for a floor 4.5m x 5.5m (clear dimension) with all four edges discontinuous and corners are held down. The live load on the slab is 3.0kN/$m^2$ and the slab is supported on walls of 230 mm thick all around. Assume floor finish as 0.65 kN/$m^2$ and ceiling finish as 0.35 kN/$m^2$. Use M20 concrete and Fe-415 steel. Sketch the reinforcement details. **16**

**OR**

5 a) What are the factors affecting deflections of RC structures? Explain. **06**

b) A rectangular simply supported RCC beam of effective span 7m is of size 300mm x 600mm. It is reinforced with 4 bars of 20mm diameter on tension side with an effective cover of 40mm If the beam is subjected to an imposed load of 30 kN/m, calculate the short term deflection. Assume M25 concrete and Fe-415 steel. **14**

**UNIT - IV**

6 a) Why does IS code require all columns to be able to resist a minimum eccentricity of the loading. **04**

b) Design a RCC column having unsupported length 3.6m to support a load of 1500kN using M25 concrete and Fe-500 steel **16**

i) As a square section
ii) As a circular section

**UNIT - V**

7 Design an isolated rectangular footing for the column of size 300mm x 450mm to support an axial load of 1000 kN. The safe bearing capacity of the soil is 160kN/$m^2$. Adopt M20 concrete and Fe-415 steel. Sketch the details of reinforcement. **20**

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