



III B.Tech I Sem Regular End Examination, December 2022

Structural Engineering –I (RCC)

(Civil)

Time: 3 Hours.**Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part – A, answer all questions which carries 20 marks.

3. In Part – B, answer any one question from each unit.

Each question carries 10 marks and may have a, b as sub questions.

PART- A**(10*2 Marks = 20 Marks)**

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|-------|---|----|-----|-----|
| 1. a) | Differentiate between characteristic load and design load? | 2M | CO1 | BL4 |
| b) | State how reinforced concrete is superior over plain concrete? | 2M | CO1 | BL1 |
| c) | Explain any two differences between working stress method of design and limit state method of design? | 2M | CO2 | BL2 |
| d) | Differentiate between under reinforced, balanced and over reinforced sections? | 2M | CO2 | BL4 |
| e) | Explain the concept of one-way shear and two-way shear in structures? | 2M | CO3 | BL2 |
| f) | Why bent up bars are used in structural components? | 2M | CO3 | BL4 |
| g) | Why shear reinforcement is not needed in case of slabs? | 2M | CO4 | BL4 |
| h) | Why torsion steel is provided in two-way slabs? | 2M | CO4 | BL4 |
| i) | Explain the function of transverse reinforcement in columns? | 2M | CO5 | BL2 |
| j) | Explain the classification of footings? | 2M | CO5 | BL2 |

PART- B**(10*5 Marks = 50 Marks)**

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|-------|---|----|-----|-----|
| 2. a) | State the suitability of steel as a Reinforcing material? Explain the stress strain relation of Reinforced concrete as per IS 456-2000? | 5M | CO1 | BL1 |
| | Determine the moment of resistance of rectangular beam of 250 X 550 mm reinforced with 3 bars of 20mm diameter in the tension zone? | 5M | CO1 | BL3 |
| b) | | | | |

OR

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|----|--|-----|-----|-----|
| 3. | A T beam has flange width of 1200mm, flange thickness 155mm and an effective depth of 725mm. The reinforcement consists of 4 bars of 25mm ϕ and the width of the rib is 255mm. Determine the maximum u.d.l that the beam can carry over an effective span of 8m if compression of rib is neglected. Take permissible stresses in concrete and steel as 6 & 180 N/mm ² . Use Working stress method of design. | 10M | CO1 | BL3 |
|----|--|-----|-----|-----|

- 4 Determine the ultimate moment of resistance of a rectangular beam of 300mm wide by 600mm effective depth, reinforced with 6 number of 20mm \emptyset bars in tension zone, and 3 number of 25mm \emptyset bars in compression zone. Use M20 concrete and Fe 415 steel bars. Take cover to compression reinforcement as 50mm and $F_{sc}=353 \text{ N/mm}^2$ 10M CO2 BL3
- OR**
- 5 A reinforced concrete I beam has effective flange widths of 925mm and thickness 110mm. The web is 150mm wide 500mm deep. Design the I-beam to carry a total load of 30kN/m including self-weight over a span of 8m. Sketch the reinforcements. Use M25 concrete and Fe415 steel. 10M CO2 BL3
- 6 An RCC beam of 350X425mm is subjected to a bending moment of 25kN-m, shear force of 10kN and torsion moment of 6kNm under service load conditions. Design and detail the longitudinal and transverse reinforcement. M20 grade of concrete and Fe250 grade steel are used. 10M CO3 BL3
- OR**
- 7 a) A simply supported T beam of 1300X100mm flange width and thickness with web width of 350mm. The beam of overall depth 550mm is subjected to 40 kN/m and reinforced with 8 bars of 28mm diameter. Design and detail the shear reinforcement using vertical stirrups? 7M CO3 BL3
- b) Explain about various factors influencing bond strength between reinforcement and concrete? 3M CO3 BL2
- 8 Design a slab for a hall of size 4.5X6.5m. Slab is simply supported on all four edges; the corner is held down and carries a superimposed load of 4.5 kN/m². Use M20 & Fe415 grades. Also draw the neat sketches showing the reinforcement. 10M CO4 BL3
- OR**
- 9 The floor slab of 8X14.5m (clear span) rests on a 230 mm thick masonry wall all around . The specified floor loading consists of a live load of 4 kN/m² , and a dead load (due to floor finish, partitions etc.) of 1.5 kN/m² in addition to the self-weight. Assuming Fe 415 steel, design and detail the floor slab. 10M CO4 BL3
- 10 A corner column 285mmX620mm located in the multi storey of a system of a braced frame, is subjected to factored loads $P_u=2200\text{kN}$, $M_{ux}=155\text{kN-m}$, $M_{uy}=85\text{kN-m}$. The unsupported length of the column is 3.5m. Design & detail the reinforcement in the column, assuming M30 concrete and Fe415 steel. 10M CO5 BL3
- OR**
- 11 Design an isolated rectangular footing for a column of size 330mmX280mm carrying an axial load of 65kN. Assume S.B.C. of soil as 200kN/m². Use M25 and Fe500 grades. Draw the neat sketch showing all the necessary details of reinforcement. 10M CO5 BL3