

107

T.E. Civil - V C-Scheme

40 + 40 + 17

22.11.23

Time: 3 Hours

Maximum Marks - 80

Note Question No. 01 is compulsory, attempt any three out of the remaining five questions
Use of IS 456:2000 is permitted
Assume suitable data if required and state it clearly

Q.1 Attempt ANY FOUR from following

- a) Explain balanced, under-reinforced and over-reinforced design with respect to Working stress method philosophy. 05
- b) Draw the Reinforcement Detailing of Two-way slab 4m x 5m clear span for the following details. 05
Ast in the shorter direction = 376.15 mm² and Ast in the longer direction = 261.93 mm². Assume diameter of the bars and also show bent up bars in both the directions.
- c) Calculate Reinforcement in the Central band for the Total Area of Reinforcement 2500 mm². Size of the Footing is 4m x 2.5m. 05
- d) A Square column 450 mm x 450 mm is reinforced with 4 no. of bars 16mm diameters using M20 grade concrete and Fe415 steel. Find the Load carrying capacity of the column if it is axially loaded short column. 05
- d) Explain Characteristic strength of Materials, Characteristic Load and partial safety factors. 05
- e) What do you mean by side face reinforcement? When it is provided in the beam. Draw reinforcement detailing showing side face reinforcement. Assume suitable data. 05
- f) Explain the condition when the beam shall be designed as a doubly reinforced beam. 05

Q.2 a) A simply supported beam of size 230 mm x 600 mm overall depth is reinforced with 4 no of bars of 12 mm diameter. Find the safe uniformly distributed load on the beam in addition to its self weight on a span of 4.5 m. The materials are M20 grade concrete and Fe415 steel. Adopt Working Stress Method. 10

b) A Singly reinforced rectangular beam 230 mm x 600 mm effective depth with 3 no. 25 mm diameter bars. Find out the factored moment of resistance of the section. The Materials are M20 grade concrete and mild steel reinforcement. Also find out moment of resistance if the materials are M20 grade concrete and Fe415 steel. Adopt Limit State Method. 10

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- Q.3**
- Determine the position of the neutral axis of a reinforced concrete beam 250 mm wide x 360 mm effective depth. If the stresses developed in concrete and steel are 6.5 N/mm^2 and 174 N/mm^2 respectively. The materials are M20 grade concrete and Fe 415 steel. Also determine the type of beam. Adopt working Stress Method. **07**
 - A T Beam of effective flange width 1100 mm, thickness of the slab is 110 mm, width of the rib is 230 mm and effective depth is 560 mm. The T beam is reinforced with 3 no. of bars 25 mm diameters at the bottom of the beam. Calculate the factored moment of resistance. The Materials are M25 concrete and Fe415 steel. Adopt LSM. **08**
 - Calculate Minimum and Maximum Percentage of Reinforcement as per IS 456:2000 for the following details. **5**
 - Tension Reinforcement in Beam, $b = 230 \text{ mm}$, $d = 460 \text{ mm}$, $D = 500 \text{ mm}$, Fe415 steel.
 - Slab of Overall Depth = 150 mm, Fe 415 steel.
 - Column of size, 450 mm x 450 mm
- Q.4**
- Design a shear reinforcement for a beam of 230 mm x 450 mm effective depth carrying a factored shear force of 200 kN. It is reinforced with 3 no of bars of 16 mm diameter. Use M20 grade concrete and Fe415 steel. Adopt Limit State Method. **10**
 - Design a simply supported slab for a room size of 8m x 3.5 m clear span, Live Load = 4 kN/m^2 , Floor finish = 1.5 kN/m^2 . Slab is resting on wall of 230 mm width. Use M25 grade concrete and Fe415 steel. Draw Reinforcement Details. **10**
- Q.5**
- Design a column, 4 m long, restrained in position and direction at both ends, to carry axial load of 1500 kN. Use M20 grade concrete and Fe415 steel. Draw Reinforcement Details. **10**
 - Write down with neat sketch, where exactly you find the critical section in the design of isolated footing for Bending moment, one way shear and Two way shear. **05**
 - Write and Explain any two assumptions that are used in limit state of collapse due to flexure. **05**
- Q.6**
- Design a Square footing for a axially loaded column of size 400 mm x 400 mm, carrying a working load of 800 kN. Use M20 concrete and Fe415 steel. Safe bearing capacity of the soil is 200 kN/m^2 . Draw reinforcement details. **12**
 - Write down the steps to design circular column with helical reinforcement. Also write different formulas that are used in the design. Assume suitable data to draw reinforcement detailing of the Circular column with helical reinforcement. **08**
