ii. A rectangular column 600mm X 400mm carries an axial load of 800 kN. Design a rectangular footing to support the column. The safe bearing capacity of the soil is 200 kN/m^2. Use M20 concrete and Fe 415 steel. **8**

OR iii. Calculate length, width and maximum bending moment for a reinforced combined rectangular footing for two columns A and B located 3.60 m apart. The sizes of the columns are 400 mm X 400 mm and 600 mm X 600 mm and the loads on them are 1000 kN and 1500 kN respectively. The projection of the footing parallel to the length of the footing beyond the axis of the column A is limited to 590 mm. The safe bearing capacity of the soil is 280 kN/mm^2. **8**

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec-2023
CE3CO28 RCC Design

Programme: B.Tech. Branch/Specialisation: CE

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Lever arm is the distance between- **1**
(a) Centres of tensile and compressive zones
(b) Centre of gravity of tensile and compressive forces
(c) Centre of tensile zone and top fibre of compressing zone
(d) None of these

ii. The maximum strain in concrete at outermost compression fibre is taken as- **1**
(a) 0.002 (b) 0.0025 (c) 0.003 (d) 0.0035

iii. As per Indian Standard the spacing of vertical stirrups in a RCC beam shall not exceed by a distance equal to- **1**
(a) Effective depth of the beam
(b) Width of the beam
(c) Lever arm of the resisting moment
(d) Total depth of the beam

iv. The diameter of bar used for stirrups, distribution steel or anchor bars should not be less than- **1**
(a) 25 mm (b) 16 mm (c) 10 mm (d) 6 mm

v. For one way slab the ratio of length and breadth of the slab should be- **1**
(a) Less than 1.5 (b) More than 1.5
(c) Less than 2 (d) More than 2

vi. In a two way slab, main reinforcement is provided along- **1**
(a) Width of slab (b) Length of slab
(c) Diagonal of the slab (d) Length and width of the slab

vii. As per IS: 456, the reinforcement in a column should not be less than- **1**
(a) 0.8% and not more than 5% of cross-sectional area
(b) 0.6% and not more than 6% of cross-sectional area
(c) 0.7% and not more than 5% of cross-sectional area
(d) 0.8% and not more than 6% of cross-sectional area

viii. A column is regarded as long column if the ratio of its effective length and lateral dimension, exceeds- **1**
(a) 10 (b) 12
(c) 15 (d) 18

ix. If the width of the foundation for two equal columns is restricted, the shape of the footing generally adopted, is- **1**
(a) Square (b) Rectangular
(c) Trapezoidal (d) Triangular

x. In a combined footing for two columns carrying unequal loads, the maximum hogging bending moment occurs at- **1**
(a) Less loaded column
(b) More loaded column
(c) A point where shear force changes sign
(d) A point of zero shear force

Q.2 i. What are the basic assumptions for the limit state of collapse in flexure as recommended by IS code. **3**

ii. A beam of rectangular section is 250mm wide and 500mm effective depth and is provided with 4 bars of 16 mm diameter as tensile steel. Find the ultimate moment of resistance. Use M20 concrete and Fe 415 steel. Use Limit State method. **7**

OR iii. Calculate area of steel of a beam of effective span 6 m to support a total working load of 12 kN/m including the self-weight of the beam, by limit state method. The width of the beam is limited to 250 mm. Use M20 concrete and Fe 415 steel. **7**

Q.3 Attempt any two:

i. A doubly reinforced beam is 200 mm wide and 350 mm deep to the centre of the tensile reinforcement. The areas of the compression and tensile steel are 1245 mm^2 and 1600 mm^2 respectively. The effective **5**

cover to the compression reinforcement is 50 mm. Find the ultimate moment of resistance of the beam section. Use M20 concrete and Fe 250 steel.

ii. A simply supported reinforced concrete beam is 250 mm wide, 500 mm effective depth and is reinforced with 5 bars of 18 mm diameter as tensile steel. If the beam is subjected to a factored shear of 140 kN at the support and two of the main bars are cranked up at 45°, find the spacing of 2-legged 6 mm diameter stirrups at support. Use M 20 concrete and Fe 250 steel. **5**

iii. A T-beam of flange width 1000 mm, flange thickness 100 mm. effective depth 550 mm and rib width 275 mm has to be designed as a balanced section. Determine the area of steel required and the limiting moment of resistance. Use M 20 concrete and Fe 415 steel. **5**

Q.4 i. Calculate maximum factored moment for a simply supported slab supported on masonry walls to the following requirements: **3**
(a) Clear span = 3m (b) Live load = 4000 N/mm^2
Use M20 concrete and Fe 415 steel.

ii. Design a simply supported slab supported on masonry walls and subjected to the factored moment = 14300 Nm. Apply check for shear if factored shear force at the edge of support is 17673 N. **7**

OR iii. Calculate reinforcement and depth of a cantilever slab to carry a live load of 3000 N/m^2. The overhang of the slab is 1.25m. Use M20 concrete and Fe 415 steel. **7**

Q.5 i. Write the assumptions made for design of column with combined axial load and uniaxial bending. **4**

ii. A short RCC column 450 mm X 450 mm is reinforced with 8 bars of 20 mm diameter. The effective length of the column is 2.75 m. Find the ultimate load for the column. Use M20 concrete and Fe 250 steel. **6**

OR iii. A reinforced concrete column is 450 mm X 400 mm and has to carry a factored load of 1800 kN. The unsupported length of the column is 2m. Find the area of reinforcement required. Use M20 concrete and Fe 250 steel. **6**

Q.6 i. What are the causes of failure of foundation? **2**