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Question Paper Code: 95103

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Fifth Semester

Civil Engineering

19UCE503 – DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Modular ratio and σ_{cbc} (N/mm^2) for M20 grade concrete are CO1- U
(a) 13.33, 7 (b) 6, 3 (c) 3, 6 (d) 7, 13.33
2. Slab of size 4 m x 5 m has 150 mm thickness is resting on brick masonry wall on all sides. Identify the correct statement. CO1- U
(a) One way slab (b) Two-way slab (c) Flat slab (d) Grid slab
3. For 2-legged stirrups of diameter 8mm the area of shear reinforcement is equal to CO1- U
(a) $140.74mm^2$ (b) $120.64 mm^2$ (c) $100.53 mm^2$ (d) $80.42 mm^2$
4. The anchorage value of standard 90° bend in mm for 16 mm dia HYSD bars CO1- U
(a) 96 (b) 128 (c) 144 (d) 160
5. The length of the stair case situated between two landings is called CO1- U
(a) Rise (b) Tread (c) Flight (d) Waist

PART – B (5 x 3= 15 Marks)

6. Draw Representative Stress, Strain Curve for Cold Worked Deformed Bas and write the definite yield point. CO1- U
7. The slab is reinforced with 10 mm dia. @ 150 mm c/c as main reinforcement and 8 mm dia @ 250 mm c/c as distribution steel. If the thickness of the slab is 150 mm draw the reinforcement details of the slab. CO2- App
8. Sketch and show the difference between Singly and Doubly reinforced beam CO2- App

9. Draw the reinforcement details of a rectangular column with 6 - 20 mm dia and 8mm ties with a spacing of 150 mm c/c CO2- App
10. Illustrate and explain where the bending moment and shear will be critical in a footing CO2- App

PART – C (5 x 16= 80Marks)

11. (a) Explain the assumptions made in working stress and Limit state design in detail. CO2- App (16)

Or

- (b) Determine the moment of resistance of a rectangular beam section of 300 mm width and 500 mm effective depth which is reinforced with 3 – 16 mm dia. at tension zone by WSD method. Consider concrete grade of M20 and steel grade Fe 415. CO2- App (16)

12. (a) Design a one – way slab with a clear span of 3.5 m, simply supported on 200 mm thick concrete masonry walls to support a live load of 4 kN/m². Adopt M – 20 grade concrete and Fe – 415 HYSD bars as per limit state method followed in IS456:2000. Draw the reinforcement details. CO2- App (16)

Or

- (b) Design a two – way slab for an office floor of size 3.5 m by 4.5 m, with discontinuous and simply supported edges on all the sides with corners prevented from lifting and supporting a service live load of 4 kN/m². Adopt M – 20 grade concrete and Fe – 415 HYSD bars as per limit state method followed in IS456:2000. Draw the reinforcement details. CO2- App (16)

13. (a) Design a singly reinforced beam to suit the following data: CO2- App (16)
Clear Span = 4 m Width of support = 300 mm
Service Load = 5 kN / m
Materials : M – 20 Grade Concrete Fe415 HYSD bars

Or

- (b) Design a reinforced concrete beam to suit the following data: CO2- App (16)
Clear Span = 5 m Width of support = 250 mm Overall depth = 450 mm
Service Load (DL + LL) = 40 kN / m Effective cover = 50 mm
Materials : M – 25 Grade Concrete Fe500 HYSD bars

14. (a) Determine the reinforcement to be provided in a square column CO2- App (16) subjected to uniaxial bending, with the following data:
Size of column 450 x 450 mm Concrete mix M 25
Characteristic strength of reinforcement 415 N/mm²
Factored load 2500 kN
Factored moment 200 kNm
Arrangement of reinforcement: (a) On two sides (b) On four sides
Draw the reinforcement details.
- Or
- (b) Illustrate the effective length of compression members with CO2- App (16) different support conditions in a tabular format with the aid of IS456–2000 and comment on the theoretical value and recommended value
15. (a) Design a square footing of uniform thickness to carry an axial load CO2- App (16) of 1200kN, size of column is 400x400mm safe bearing capacity of soil is 150 kN/m². Use M20 grade of concrete and Fe 415 steel.
- Or
- (b) Design a suitable footing for a R.C. column of size 300 x 500mm. CO2- App (16) Supporting a factored axial load of 1500kN. Assume safe bearing capacity of soil as 200 kN/m² Adopt M20 grade of concrete and Fe415 grade of steel. Sketch the details of reinforcements in footings.

