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Question Paper Code: U5103

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Fifth Semester

Civil Engineering

21UCE503 – DESIGN OF REINFORCED CONCRETE ELEMENTS

(Regulations 2021)

(IS 456:2000 code book is permitted)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. In working stress method of design, the modular ratio for M25 grade of concrete. CO1 –U
2. Define characteristic strength of concrete. CO1 –U
3. Define two way slab with neat sketch CO2 –U
4. What are the basic value of span to effective depth ratios for span upto 10m as per IS 456:2000 CO2 –U
5. How will you calculate the effective breadth of flange in 'T' beam CO3 –U
6. Compare singly reinforced beam and doubly reinforced of beam CO3 –U
7. What is meant by compression member CO4 –U
8. What is Meant by Slenderness Ratio CO4 –U
9. Draw with neat sketch of any three footings. CO5 -U
10. What do you meant by Development length of bar. CO5 -U

PART – B (5 x 16= 80 Marks)

11. (a) A simply supported reinforced concrete one way slab with an effective span of 4m is reinforced with 10 mm diameter, Fe 415 HYSD bars spaced at 200 mm centers at an effective depth of 150 mm. Using M 20 grade concrete, analyze whether the slab can take the maximum permissible live load of 5 kN/m^2 , if the self-weight of the slab and finishes are 5.5 kN/m^2 . CO1- Ana (16)

Or

- (b) A simply supported R.C.C. slab is having the following specifications. CO1- Ana (16)
 Overall Depth = 160 mm, Effective Depth = 150 mm reinforced with 12mm dia. bars at 120 mm spacing. The effective span is 4 m. Self-weight of the slab and finishes is 4.2 kN/m^2 . Analyze whether the slab can take the maximum permissible live load of 5 kN/m^2 , Adopt M 20 grade concrete and Fe 415 steel.
12. (a) 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/m^2 . Adopt M – 20 grade concrete and Fe – 415 HYSD bars as per limit state method followed in IS456:2000. Draw the reinforcement details. CO2 -Ana (16)
- Or
- (b) A one – way slab with a clear span of 3.5 m and effective depth of 140 mm is simply supported on 200 mm thick concrete masonry walls to support a ultimate moment of 23 kNm and a shear of 20 kN. Adopt M – 20 grade concrete and Fe – 415 HYSD bars. The slab is provided with a main reinforcement of 10 mm dia. Bars at 160 mm c/c spacing and distribution steel of 8 mm dia. bars at 250 mm c/c spacing. Analyze the slab for shear capacity, deflection control and adequacy of reinforcement using SP16. CO2 -Ana (16)
13. (a) Design a singly reinforced beam to suit the following data: CO3 -App (16)
 Clear Span = 4 m
 Width of support = 300 mm
 Service Load = 5 kN/m , Assume (b)=200mm
 Materials : M – 20 Grade Concrete , Fe415 HYSD bars
- Or
- (b) Design a reinforced concrete beam to suit the following data: CO3- App (16)
 Clear Span = 5 m
 Width of support = 250 mm
 Overall depth = 500 mm
 Service Load (DL + LL) = 40 kN/m Effective cover = 50 mm
 Materials : M – 25 Grade Concrete, Fe415 HYSD bars

14. (a) Design a short square column using M20 grade concrete and Fe415 grade steel to carry an axial load of 1000 kN by limit state method. CO4 -App (16)

Or

- (b) Determine the reinforcement to be provided in a column subjected to uniaxial bending, with the following data: CO4 -App (16)
Size of column 300 x 500 mm
Concrete mix M 20
Characteristic strength of reinforcement 415 N/mm²
Factored load 500 kN
Factored moment 200 kNm

15. (a) Design a square footing of uniform thickness to carry an axial load 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. CO5 -App (16)

Or

- (b) Design a dog legged stairs for an office building in a room measuring 3 x 6 m clear. Vertical distance between the floors is 3.5m. width of flight is to be 1.25m. allow a live load of 3kN/m². sketch the details of the reinforcements. Use M20 concrete and Fe415 steel. Assume the stairs are supported on 230mm walls at the end of outer edges of landing slabs. CO5 -App (16)

