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QUESTION BANK

Subject with Code: ADVANCED REINFORCED CONCRETE DESIGN (ARCD) (16CE2010)

Course & Branch: M. Tech - Structural Engineering

Year & Sem: I M.TECH & II-Sem **Regulation:** R16

UNIT-I

ESTIMATION OF CRACK WIDTH AND REDISTRIBUTION OF MOMENTS IN REINFORCED CONCRETE BEAMS

1. A simply supported rectangular beam 300 mm x 500 mm, having an effective span of 6 m, is subjected to UDL o 16 KN/m, inclusive of its self weight. The beam is reinforced with 3 bars of 20 mm diameter, at an effective cover of 50 mm. Assuming M20 concrete and Fe415 steel. Calculate the surface Crack with at the following locations.

   a) At a point 'A 'directly under a bar on tension face

   b) At the bottom corner 'B 'of the beam

   c) At a point 'C 'distant 2(d-x)/3 from N.A, where crack width is likely to be maximum.

2. a) Advantage and disadvantages of moment redistribution

   b) Explain moment curvature relation of reinforcement concrete sections

3. a)Calculation of Crack width in Beams

   b) Factors affecting Crack width in beams

4. A beam AB of 4 m span and fixed at the ends, carries an UDL of 30 KN/m at collapse. Draw maximum bending moment diagram as per IS code recommendations for redistribution of moments.

5. A simply supported T-beam span of 5 mts is subjected to a moment of 85 KN/m at mid span. The section of beam is as shown in figure. Calculate the crack width at corner A, directly under tension reinforcement B & the centre tension face C. the materials are M20 grade concrete and Fe415 steel.

6. a) Explain moment curvature relation of reinforcement concrete sections

   b) Factors affecting Crack width in beams

7. A beam of AB span 4 mts fixed at one end and freely supported at other end carring a UDL of 30 KN/m at collapse. Draw maximum BM as per recommendation of code IS 456-2000 for redistribution of moment.

8. (a)What are the major factors which influence the crack width in flexural members?

   (b)A beam of width 450 mm, depth 700 mm cover of reinforcement 40 mm is reinforced with 3 rods of 40 mm diameter.Determine the crack width when the section is subjected to a BM of 490 kNm at a point on the side of the beam 250 mm below the neutral axis.

9. (a)What are the major factors which influence crack-widths in flexural members?
   (b)Discuss the issues involved in designing for achieving control over thermal and shrinkage cracks in large R.C structures.
10. (a)What are the different options available to a designer with regard to control of cracking in flexural members?
    (b)Are the normal designing requirements of the code adequate for ensuring crack-width control? Give comment on this.

UNIT-II

DESIGN OF DEEP BEAMS AND CORBELS

1. Design a single span deep beam to suit the following data and also draw reinforcement details in deep beam

   Effective span of the beam=6m

   Overall depth of the beam=6m

   Width of support =0.6m

   Width of beam=0.4 m

   Total load on beam including self weight= 400KN/m

   Concrete= M20 Grade

   Steel =Fe415 HYSD bars

2. Design a 3span continuous deep beam carrying a characteristic load of 210KN/m inclusive of its self weight for the beam, clear span is 4.5 m width of support 250 mm. thickness of the beam 230 mm and Overall depth of 2.7 m. the materials are M20 Grade concrete and and HYSD reinforced of grade Fe415.

3. Simply supported beam of 250 mm wide and 1500 mm overall depth & 2300 mm clear span is simply supported on 200 mm wide support on either side it carries UDL of 200KN/m inclusive of its self weight. Design the beam using M20 concrete and Fe415 Grade.

4. Explain the procedure for continuous deep beam and draw the reinforcement details

5. Design a continuous deep beam having more than 3 spans and loaded a UDL of 180KN/m inclusive of self weight for the beam the clear span 5 mts.width of supports 300 mm beam thickness 250 mm. Overall thickness of beam is 3.5 mts. The material used are M20 HYSD bars of 415.

6. A simply supported deep beam 200 mm wide x 1800 mm overall depth and 2750 mm clear span is simply supported on 250 mm wide supports on either sides. It carries a characteristic UDL of 260KN/m inclusive of its self weight.Design and details the beam. The materials are M20 Grade concrete and HYSD reinforced of grade Fe415.

7. The reinforced concrete beam girder is continuous over spans of 8 m apart from c/c. It is 4.4 m deep and 330 mm thick and supports of column 900 mm width. If the girder supports a UDL of 210KN/m inclusive its own weight. Design Deep beam using M20 Grade concrete and Fe415 Grade steel.

8. Simply supported beam of 250 mm wide and 1500 mm overall depth & 2300 mm clear span is simply supported on 200 mm wide support on either side it carries UDL of 200KN/m inclusive of its self weight. Design the beam using M20 concrete and Fe415 Grade.

9. A reinforced concrete deep girder is continuous over span of 10 m apart from centre to centre. It is 4.6 m deep, 300 mm thick and the supports are columns 900 mm in width. If the girder supports a UDL of180 kN/m, design the reinforcement required if M20 concrete and Fe415 steel is used

10. Design a simply supported deep beam to the following data:

    Clear span = 4.20 m

    Bearing at each end = 450 mm

    Overall depth = 3500 mm

    Width of beam = 250 mm

    Supper imposed load = 250 kN/m

    Use M20 concrete and Fe415 steel.

UNIT-III

DESIGN OF RIBBED (VOIDED) SLABS

1. A simply supported one way ribbed slab of 5 m span is to be used for 3 KN/m^3 live load. Design the slab using M20 grade concrete and HYSD bars of grade Fe 415.
2. Design a continuous ribbed slab with 3 equal spans of 5.8 m. the riobs supports on the beam with over span is 250 mm x 600 mm. take live load on the slabs is 3 KN/m^2 use M20 Grade concrete and Fe415 steel.
3. Explain the Analysis and Design procedure for ribbed Slabs
4. A simply supported one way ribbed slab of 6 m span is to be used for 5 KN/m^3 live load. Design the slab using M20 grade concrete and HYSD bars of grade Fe 415.
5. Write short notes on:

   (a)Shear effect in two-way slab with beams.

   (b)Flat slabs with opening.

   (c)ACI guidelines for shear calculations.

   (d)Strengthening of columns for shear and torsion

6. Short note on:

   (a)Shear due to unbalanced moments.

   (b)Effect of opening in flat slab.

   (c)Strengthening of column areas for moment transfer.

   (d)Shear design guidelines as per ACI code.

7.A simply supported one way ribbed slab of 5m span is to be used for 3 kn/m^2 live load design the slab using M20 grade concrete and Fe 415 HYSD bars.

Ribs are spaced at 450mm c/c.

The thickness of topping as 60 mm.

Width of rib as 120mm.

Over all depth is 300mm.

8.Design a continuous ribbed slab with 3 equal spans at 5.8m the ribs support on the beam with over span is 250mm x 600mm. take live load on the slab is 3Kn/m^2 use M20 grade concrete and Fe415 steel.

Ribs are spaced at 450mm c/c

The thickness of topping as 60 mm

Width of rib as 120mm

Over all depth is 300mm

9.A simply supported one way ribbed slab of 6m span is to be used for 5 kn/m^2 live load design the slab using M25 grade concrete and Fe 415 HYSD bars.

Ribs are spaced at 450mm c/c.

The thickness of topping as 50 mm.

Width of rib as 120mm.

Over all depth is 250mm.

10.Design a continuous ribbed slab with 4 equal spans at 5.8m the ribs support on the beam with over span is 250mm x 600mm. take live load on the slab is 4Kn/m^2 use M25 grade concrete and Fe415 steel.

Ribs are spaced at 450mm c/c

The thickness of topping as 60 mm

Width of rib as 120mm

Over all depth is 300mm

UNIT-IV

DESIGN OF GRID FLOORS AND FLAT SLAB

1.A flat plate 7 × 6 m panel on 500 × 500 mm column has a slab thickness of 180 mm, designed for a load of 9.3 kN/m2 Check for the safety of slab in shear and also determine the necessary stirrups for reinforcing the slab. Adopt M25 and Fe 415.

2.A flat plate with 7.5*7.5m panels on 500*500mm columns has a slab thickness of 180 mm, designed for a total load of 9.0 kN/m2. Check the safety of slab in shear and also find the stirrups for reinforcing in the slab. Use M25 and Fe415.

3.R.C.Grid floor is to be designed to cover a floor area of 12 m X 8 m. The spacing of ribs in mutually perpendicular directions is 1.5 m centre to centre. Live load on the floor is 2KN/m. Analyze the grid floor by IS 456 methods and enumerate the suitable reinforcements

4.Design an interior panel o a flat slab of size 5 m X 5 m without providing drop and column head. Size of column is 500 X 500 mm and live load on the panel is 4KN/m^2. Take floor finishing load as 1 KN/m^2.Use M20 Concrete and Fe 415 steel

5.A reinforced grid floor is to be design to cover of 12m x 18m the spacing of the ribs is mutually perpendicular direction is 1.5m c/c. live load of floor is 3 Kn/m^2 adopt M20 grade concrete and Fe415 steel assume ends are simply supported analyze the the grid floor using IS456:2000 method and design suitable reinforcement in the grid floor.

6.A reinforced grid floor is to be design to cover of 16m x 22m the spacing of the ribs is mutually perpendicular direction is 2m c/c. live load of floor is 3 Kn/m^2 adopt M25 grade concrete and Fe415 steel assume ends are simply supported analyze the the grid floor using IS456:2000 method and design suitable reinforcement in the grid floor.

7.A reinforced grid floor is to be design to cover of 9m x 12m the spacing of the ribs is mutually perpendicular direction is 1.1m c/c. live load of floor is 2 Kn/m^2 adopt M20 grade concrete and Fe415 steel assume ends are simply supported analyze the the grid floor using IS456:2000 method and design suitable reinforcement in the grid floor.

8.Design the interior panel of a flat-slab floor system for a ware house 24m divided into panels of 6m*6m.

Loading class = 5Kn/m^2

Materials : M20 grade concrete,Fe 415 HYSD bars

Column size =400 mm diameter

9.Design the exterior panel of a flat-slab floor system for a ware house 24m divided into panels of 6m*6m.

Loading class = 4Kn/m^2

Materials : M25 grade concrete,Fe 415 HYSD bars

Column size =400 mm diameter

10..A flat plate with 7.5*7.5m panels on 500*500mm columns has a slab thickness of 180 mm, designed for a total load of 8.0 kN/m2. Check the safety of slab in shear and also find the stirrups for reinforcing in the slab. Use M20 and Fe415

2.A flat plate with 7.5*7.5m panels on 400*400mm columns has a slab thickness of 180 mm, designed for a total load of 9.0 kN/m2. Check the safety of slab in shear and also find the stirrups for reinforcing in the slab. Use M20 and Fe415.

UNIT-V

DESIGN OF PLAIN CONCRETE WALLS AND SHEAR WALLS

1.A plain braced concrete wall of dimensions 8 m high, 6m long and 200 mm thick is restrained against rotation at its base and unrestrained at the ends. If it has to carry a factored total gravity load of 200 KN and a factored horizontal load of 8 KN at top. Check the safety of the wall. Assume M20 concrete and Fe 415 steel.

2.Estimate the reinforcement of a shear wall of length 4.16 m and thickness 250 mm is subjected to the following forces f_{ck}=25 N/mm^2, f_y= 500 N/mm^2

S.No	Loading	Axial Load (KN)	Shear Force (KN)	Bending Moment (KN-m)
1	DL + LL	1950	600	20
2	Seismic Load	250	4800	700

3.Design a shear wall of length 5.0 m and thickness 250 mm subjected to the forces given below and the wall is a high wall with the following loadings. Use M25 and Fe415.

S.No	Loading	Axial Load (KN)	Shear Force (KN)	Bending Moment (KN-m)
1	DL + LL	1950	500	20
2	Seismic Load	200	4500	800

4.Design a shear wall subjected to P_u=12000kn and M_u=11000km.m. the materials used are M30 grade concrete and Fe 415 steel and thickness of wall is 200mm and length is 6m design the wall

- Using interaction chart
- Using elastic stress distribution design end portion of height 600mm
- Assume end zone to resist moment and 500mm X 500mm column at end zone.

5. Design a shear wall subjected to P_u=10000kn and M_u=8000km.m. the materials used are M30 grade concrete and Fe 415 steel and thickness of wall is 150mm and length is 5m design the wall

- Using interaction chart
- Using elastic stress distribution design end portion of height 600mm
- Assume end zone to resist moment and 500mm X 500mm column at end zone.

6. Design a shear wall subjected to P_u=15000kn and M_u=11000km.m. the materials used are M25 grade concrete and Fe 415 steel and thickness of wall is 200mm and length is 6m design the wall

- Using interaction chart
- Using elastic stress distribution design end portion of height 600mm
- Assume end zone to resist moment and 500mm X 500mm column at end zone.

7. Briefly explain the classifications of shear wall with neat sketch?

8. Explain the design procedure to design the shear wall?

9. A plain braced concrete wall of dimensions 10 m high, 6m long and 200 mm thick is restrained against rotation at its base and unrestrained at the ends. If it has to carry a factored total gravity load of 250 KN and a factored horizontal load of 10 KN at top. Check the safety of the wall. Assume M25 concrete and Fe 415 steel.

10. Design a shear wall of length 5.0 m and thickness 250 mm subjected to the forces given below and the wall is a high wall with the following loadings. Use M25 and Fe415.

S.No	Loading	Axial Load (KN)	Shear Force (KN)	Bending Moment (KN-m)
1	DL + LL	1950	500	20
2	Seismic Load	200	4500	800

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