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**QUESTION BANK**

**Subject with Code: DESIGN OF ADVANCED CONCRETE STRUCTURES (18CE1017)**

**Course & Branch**: M. Tech - Structural Engineering

**Year & Sem:** I M.TECH & II-Sem **Regulation:** R18

## UNIT-I

## ESTIMATION OF CRACK WIDTH IN REINFORCED CONCRETE MEMBERS

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. [12M]

   At a point ‘A ‘directly under a bar on tension face

   At the bottom corner ‘B ‘of the beam

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

2. a) Calculation of Crack width in Beams [6M]

   b) Factors affecting Crack width in beams [6M]

3. 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 center tension face C. the materials are M20 grade concrete and Fe415 steel. . [12M]

4. a) Explain moment curvature relation of reinforcement concrete sections [6M]

   Factors affecting Crack width in beams [6M]

5. 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. . [12M]

6. (a) What are the major factors which influence the crack width in flexural members? [6M]

   a) 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 Kn m at a point on the side of the beam 250 mm below the neutral axis.

7. (a) What are the major factors which influence crack-widths in flexural members? [6M]

   (b) Discuss the issues involved in designing for achieving control over thermal and shrinkage cracks in large R.C structures. [6M]

8. (a) What are the different options available to a designer with regard to control of cracking in flexural members? [6M]

   (b) Are the normal designing requirements of the code adequate for ensuring crack-width Control ? Give comment on this. [6M]

9. A simply supported rectangular beam 400 mm x 600 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 40 mm. Assuming M30 concrete and Fe415 steel. Calculate the surface Crack with at the following locations. [12M]

   At a point ‘A ‘directly under a bar on tension face

   At the bottom corner ‘B ‘of the beam

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

10. A beam of width 500 mm, depth 700 mm cover of reinforcement 50 mm is reinforced with 3 rods of 40 mm diameter. Determine the crack width when the section is subjected to a BM of 500 Kn m at a point on the side of the beam 250 mm below the neutral axis. [12M]

## UNIT-II

## DESIGN OF DEEP BEAMS

1. Design a single span deep beam to suit the following data and also draw reinforcement details in deep beam. [12M]

   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. . [12M]

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. . [12M]

4. Explain the procedure for continuous deep beam and draw the reinforcement details.[12M]

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. [12M]

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. [12M]

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. . [12M]

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. . [12M]

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. [12M]

10. Design a simply supported deep beam to the following data: [12M]

    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 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. . [12M]
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. . [12M]
3. 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. [12M]
4. Design the interior panel of a flat-slab floor system for a ware house 24m divided into panels of 6mX6m. . [12M]

   Loading class = 5Kn/$m^2$

   Materials : M20 grade concrete,Fe 415 HYSD bars

   Column size =400 mm diameter
5. Design the exterior panel of a flat-slab floor system for a ware house 24m divided into panels of 6m*6m. . [12M]

   Loading class = 4Kn/$m^2$

   Materials : M25 grade concrete,Fe 415 HYSD bars

   Column size =400 mm diameter

6..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 .[12M]

6. A flat plate with 9*9m 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. . [12M]
7. Design an interior panel o a flat slab of size 8m X 8 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. [12M]
8. Design the interior panel of a flat-slab floor system for a ware house 24m divided into panels of 8Mx8m. . [12M]

   Loading class = 5Kn/$m^2$

   Materials : M20 grade concrete,Fe 415 HYSD bars

Column size =400 mm diameter

9. A flat plate 9 × 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. . [12M]
10. A flat plate with 8*8m 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. . [12M]

## UNIT-IV

## 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. .[12M]
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. [12M]
3. Explain the Analysis and Design procedure for ribbed Slabs .[12M]
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. . [12M]
5. Write short notes on: . [12M]

   (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: [12M]

   (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. . [12M]

   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. . [12M]

   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. .[12M]

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. . [12M]

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-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. . [12M]

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$^2$ .[12M]

| S.No | Loading | Axial Load (KN) | Shear Force (KN) | Bending Moment (KN-m) |
|---|---|---|---|---|
| 1 | DL + LL | 1950 | 600 | 20 |
| 2 | Seismic Load | 250 | 4800 | 70 |

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. .[12M]

| S.No | Loading | Axial Load (KN) | Shear Force (KN) | Bending Moment (KN-m) |
|---|---|---|---|---|
| 1 | DL + LL | 1950 | 500 | 20 |
| 2 | Seismic Load | 200 | 4500 | 80 |

4.Design a shear wall subjected to $P_u$=12000kn and $M_u$=11000kn.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 . [12M]
- 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 $M_u$=8000kn.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 $P_u$=15000 kn and $M_u$=11000 kn.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. [12M]
   - 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? .[12M]
8. Explain the design procedure to design the shear wall? .[12M]
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. .[12M]
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. . [12M]

| S.No | Loading | Axial Load (KN) | Shear Force (KN) | Bending Moment (KN-m) |
|---|---|---|---|---|
| 1 | DL + LL | 1950 | 500 | 20 |
| 2 | Seismic Load | 200 | 4500 | 80 |

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