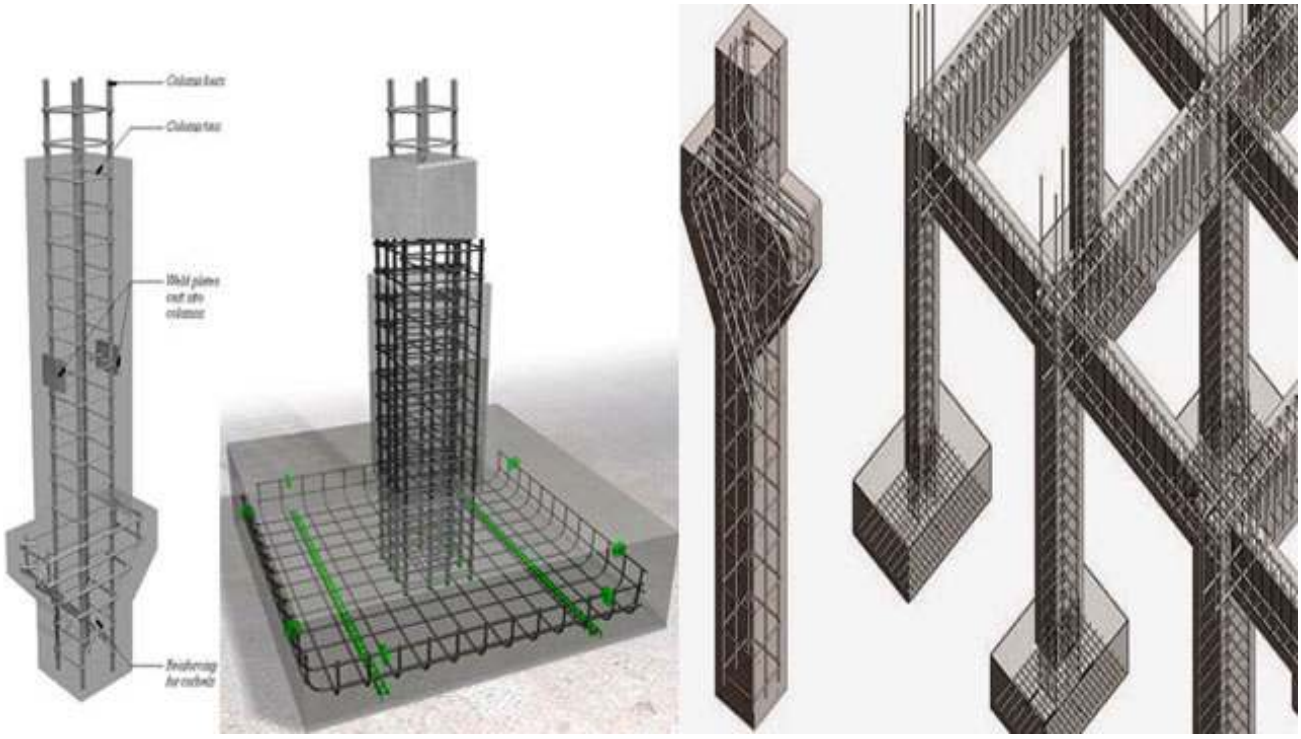
# MUTHAYAMMAL ENGINEERING COLLEGE

## (Approved by AICTE, Affiliated to Anna University)

## Rasipuram-637408, Namakkal District, Tamilnadu, India

## DEPARTMENT OF CIVIL ENGINEERING



**Course Code / Name : 19CEC09 & Design of Reinforced Concrete Elements**
**Year / Sem : III / V**

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**(An Autonomous Institution)**

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

Estd. 2000

## Department of Civil Engineering
## Question Bank - Academic Year (2021-22)

**Course Code & Course Name : 19CEC09 & Design of Reinforced Concrete Elements**

**Year/Sem/Sec : III/V**

### Unit-I: Methods of design of Concrete Structures

### Part-A (2 Marks)

1. What is the importance of Elastic method over limit state methods
2. What is the formula used to find the actual neutral axis in working stress method?
3. Write any two advantages of limit state method over elastic method.
4. What is the formula used to find the actual neutral axis in working stress method?
5. What are the advantages of ultimate method over elastic method?
6. Define limit state of collapse and limit state of serviceability.
7. Draw stress strain diagrams for a beam for elastic method, Ultimate load method and limit state method (LSD)
8. What is the philosophy of limit state method?
9. State the assumptions made for design of RC members in working stress method.
10. On what circumstances doubly Reinforced sections are to be adopted?

### Part-B (16Marks)

1. A Reinforced concrete rectangular beam is supported on two walls 750 mm thick, spaced at a clear distance of 6.5m. The beam carries a super imposed load of 30 kN/m. Design the beam in working stress method, Use M20 grade concrete and M.S bars. Draw reinforcement details. (16)
2. Explain the codal recommendations for limit states design? State their significance. (16)
3. A beam, simply supported over an effective span of 8m carries a live load of 15kN/m. Design the beam, using M20 concrete and Fe415 grade stole. Keep the width equal to half the effective depth. Use working stress method of Design. (16)
4. Design a simply supported reinforced concrete beam to carry a bending moment of 50kNm as doubly reinforced section by working stress design. Keep the width is equal to half the effective depth. (16)
5. A reinforced concrete floor slab for a room having inside dimension 4m X10 m and supported on all sides by 400 mm thick brick wall. The super imposed load may be taken as 4 $kN/m^2$ .Adopt M20 grade of concrete and steel grade Fe415 HYSD bars. (16)

## Unit –II: Limit State Design of Beams

### Part –A (2 Marks)

1. What is the significance of doubly reinforced method?
2. Write any two advantages of flanged beams.
3. On what circumstances double reinforced beams are to be adopted?
4. Write any two general features of two way slab?
5. Differentiate under reinforced and over reinforced sections.
6. What are the different modes of shear failure in RC beam?
7. What are the minimum and maximum reinforcement for a beam in LSD?
8. Distinguish between the behavior of one way slab and two way slabs?
9. Differentiate bond and anchorage.
10. Give any two structural members subjected to torsion?

### Part-B (16Marks)

1. A T.beam slab floor of an office comprises of a slab 150mm thick spanning between ribs spaced at 3m centers. The effective span of the beam is 7.5 .live load on floor is 4.0 $kN/m^2$ .Using M20 grade and Fe415 HYSD bars. Design one of the intermediate Tee beams. Use limit state method. (16)
2. Design a T-beam section with a flange width of 1200 mm, a flange depth of 100 mm, a web width of 250 mm and an effective depth of 500 mm, which is subjected to a factored moment of 550 kNm. The concrete mix is to be used is of grade M20 and steel is of grade Fe415. Use limit state method. (16)
3. A Simply supported one way slab of 4m span carries a live load of $N/m^2$ .The slab, having a total depth of 150 mm is reinforced with 8mm ϕ bars @ 100 mm c/c at a nominal over of 20mm. Assuming a permanent load equal to dead load plus 20% of live load, compute the total maximum deflection and chock it as per code requirements. Use M20 concrete and Fe415 steel. (16)
4. Calculate ultimate moment of resistance of the beam of size 300mm X500 mm provided with tensile reinforcement of 9000 $mm^2$ and compression reinforcement of 3000 $mm^2$.Take the effective cover at top and bottom is 40mm. (16)
5. (i) Explain in the step by step procedure of design of masonry walls.(8)

   (ii) How do you improve lateral load resisting capacity of masonry walls?(8)

## Unit – III: Limit State Design of Slabs

### Part –A (2 Marks)

1. What is the importance of anchorage value of bends?
2. Define shear friction.
3. What is the important mechanism of shear resistance in beams with web reinforcement?
4. Define flexural bond and anchorage bond.
5. Explain the check for shear and design of shear reinforcement in RC beams.
6. What is meant by anchorage length?

7. Determine the anchorage length for 20mm diameter bar
8. What is torsional shear?
9. Write the different types of staircase.
10. Define tread and rise.

**Part-B (16 Marks)**

1. Explain the terms Diagonal tension and bond stress with reference to R.C beams.(16)
2. Design a shear of rectangular reinforced concrete beam section to carry a factored bending Moment of 220 kNm, factored shear force of 140 kN, and a factored torsional moment of 80 kNm. Use M20 grade concrete and Fe415 steel.(16)
3. A rectangular beam with b=350 mm and d=550mm has a factored shear of 400 kN at the critical section near the support. The steel at the tension side of the section consists of four 32 mm dia bars which are continued to support. Assuming $f_{ck}$=25 N/mm$^2$ and $f_y$=415 N/mm$^2$, design the vertical stirrups for the section. Use limit state method. (16)
4. Design the shear reinforcement for a beam 150mmX300mm effective depth subjected to 15 kN/m.the span of the beam is 5m. Take tensile reinforcement at a section is 1.2%.(16)
5. A Rectangular column 550 X 350 mm carries a load of 775 kN. Design a rectangular footing to support the column. The safe bearing capacity of the soil is 210 kN/m$^2$ .Use M15 grade concrete. (16)

**Unit – IV: Limit state design of columns**

**Part –A (2 marks)**

1. Write any two salient assumptions are made for the limit state design of columns.
2. What are the important limitations of slender columns?
3. Write any two reinforcement provision in columns.
4. What is the salient condition for minimum eccentricity of column?
5. What are slender columns?
6. How do you calculate the depth of footing based on Rankine's formula?
7. What is the need of minimum eccentricity clause for a column design?
8. What is meant by braced column?
9. Write the expression for eccentricity of columns.
10. Differentiate circular and rectangular column.

**Part-B (16Marks)**

1. Design a column having an effective length of 4.50 m to support a factored load of 1580 kN. Consider the reinforcement ratio p to in the range 1.5 to 2.0 percent and the effective cover to longitudinal steel of 55 mm. The materials to be used are M25 grade of concrete and HYSD steel bars of grade Fe415. (16)
2. Design a column having an effective length of 4.50 m to support a factored load of 1600 kN. Consider the reinforcement ratio p to be in the range 1.5 to 2.0 percent and the effective

cover to longitudinal steel of 55mm. The materials to be used are M25 grade of concrete and HYSD steel bars of grade Fe415. (16)

3. Design a rectangular column of 4.5 m unsupported length, restrained in position and direction at both the ends, to carry and axial load of 1200 kN. Use M20 concrete and Fe415 steel. (16)
4. Design a short column to carry an axial load of 1200 kN and moment of 60 kNm about the major axis. The effective height of column is 3m. (16)
5. Explain in detail about the following methods of design. (16)
   (i) Elastic method
   (ii) Ultimate load method
   (iii) Unit state method
   Also explain their merits and demerits.

## Unit – V: Limit state design of footing

### Part –A (2Marks)

1. Why the dowel bars are provided in footing?
2. Define punching shear.
3. Define punching shear.
4. Enumerate proportioning of footings.
5. What are the types of combined footings?
6. List out any two factors which affect the permissible stress of masonry?
7. What are forces to be considered while designing the footing?
8. When do you prefer combined footing?
9. Draw a neat sketch of wall footing.
10. Draw the cross section of strip footing.

### PART-B (16Marks)

1. A 230 mm thick masonry wall is to be provided with a reinforced concrete footing on a site having soil with SBC. Unit weight and angle of repose of 135 kN/$m^2$ 18 kN/$m^2$ and $30^0$ respectively. The M20 grade of concrete and HYSD stoel bars of grade Fe415.Design the footing when the wall supports at service state: a load of 150 kN/m lengths. (16)
2. A Rectangular column 550 X 350 mm carries a load of 775 kN. Design a rectangular footing to support the column. The safe bearing capacity of the soil is 210 kN/$m^2$ .Use M15 grade concrete. (16)
3. Design a square footing for a short axially loaded column of size 300 mm X300 mm carrying 600kN load .Use M20 concrete and Fe415 steel. SBC of soil is 180 kN/$m^2$ .Sketch the details of reinforcement. (16)
4. Design a rectangular footing for a column 400mm X 400 mm to transfer an axial load of 10000 kN. The safe bearing capacity of soil is 150 kN/$m^2$. (16)
5. Design a footing to carry a strip load of 100 kN/m transferred by a wall of width 0.5 m. Safe bearing capacity of the soil is 150 kN/$m^2$. (16)

**Course Faculty** **HoD**