CENTRAL POLYTECHNIC COLLEGE, THARAMANI-600 113.
(An Autonomous Institution)

# DEPARTMENT OF CIVIL ENGINEERING

QUESTION BANK

## ECE51010 – Design of RCC structures (Limit state method)

| ECE51010 | Design of RCC Structures | L | T | P | C |
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| Theory | (Limit State Method) | 4 | 0 | 0 | 4 |

| Unit I | INTRODUCTION TO REINFORCED CEMENT CONCRETE STRUCTURES | |
|---|---|---|
| | **1.1 INTRODUCTION TO LIMIT STATE METHOD OF DESIGN IN CONCRETE** Reinforced Cement Concrete Materials used in R.C.C and their basic requirement- Purpose of providing reinforcement-Different types and grades of cement and steel - Characteristic strength and grades of concrete as per IS 456 - 2000. Limit State Method - Concept -Advantages- Different limit states Characteristic strength and design strength of materials - Characteristic loads and design loads - Partial safety factors for loads and material strength **1.2 MOMENT OF RESISTANCE OF RECTANGULAR SECTIONS** Limit state of collapse in flexure - Assumptions -Limiting values of neutral axis of singly reinforced section for different grades of steel - Moment of resistance of singly and doubly reinforced rectangular sections- Problems.. | 12 |
| **Unit II** | **DESIGN OF RECTANGULAR BEAMS FOR FLEXURE AND SHEAR** | |
| | **2.1. DESIGN OF RECTANGULAR BEAMS FOR FLEXURE** Design requirements- Effective spans of cantilever and simply supported beams - Breadth and depth requirements of beams - Control of deflection - Minimum depth requirement for stiffness-Minimum concrete cover to reinforcement steel for durability and fire resistance - Minimum and maximum areas/ spacing for main reinforcement and side face reinforcement as per IS 456 -2000- Development Length - Anchorage values of bends and hooks - Curtailment of reinforcements- Design bending moments - Design of singly and doubly reinforced rectangular beams (Cantilevers and Simply supported beams carrying udl only)- Problems. **2.2 DESIGN OF BEAMS FOR SHEAR** Limit state of collapse in shear - Design shear strength of concrete - Design shear strengths of vertical / inclined stirrups and bent up bars - Principle of shear design - Critical sections for shear- S.F Coefficients specified by IS:456- 2000 - Nominal shear stress - Minimum shear reinforcement - Design of rectangular beams using vertical stirrups by limit state method.. | 12 |
| **Unit III** | **DESIGN OF T-BEAMS AND CONTINUOUS BEAMS** | |
| | **3.1 DESIGN OF T-BEAMS FOR FLEXURE** Cross sections of Tee and L-beams- Effective width of flange- Neutral Axis and M.R of Singly Reinforced T-Sections- Design of singly reinforced T beams for flexure-Problems on Simply supported T- beams carrying udl only. **3.2 DESIGN OF CONTINUOUS BEAMS FOR FLEXURE** Methods of analysis of continuous beams- Effective Span- Arrangement of Loading for Critical Bending Moments- B.M coefficients specified by IS:456- 2000-Design of rectangular continuous beams (Singly Reinforced) using B.M. coefficients (equal spans &u.d.l only) for sagging and hogging moments. | 12 |
| **Unit IV** | **DESIGN OF SLABS** | |

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| | **4.1 DESIGN OF ONE WAY SLABS** Classification of Slabs Effective spans - Loads (DL and IL) on floor/roof slabs and stairs (IS:875-1987) - Strength and Stiffness requirements - Minimum and maximum permitted size, spacing and area of main and secondary reinforcements as per IS 456 - 2000- Cover requirement to reinforcements in slabs- Design of cantilever/simply supported one way slabs by limit state method - Check for shear and stiffness. **4.2 DESIGN OF TWO WAY SLABS** Introduction -Effective spans -Thickness of slab for strength and stiffness requirements - Middle and Edge strips - B.M coefficients as per IS:456 for Simply supported and Continuous slabs - Design of simply supported two way slabs. | 12 |
| **UnitV** | **DESIGN OF R.C.C. COLUMNS AND COLUMN FOOTINGS** | |
| | **5.1 DESIGN OF R.C.C COLUMNS** Limit state of collapse in compression - Assumptions - Limiting strength of short axially loaded compression members - Effective length of compression members - Slenderness limits for columns - Classification of columns -Minimum eccentricity for column loads - Longitudinal and Transverse reinforcement requirements as per I S 456-2000 - Cover requirement - Design of axially loaded short columns with lateral ties. **5.2 DESIGN OF COLUMN FOOTING** Basic requirements of Footings-Types of R.C footings - Minimum depth below GL- Footings with uniform thickness and varying thickness (sloped footing) – Critical sections for BM, Transverse/Punching Shears – Minimum reinforcement - Development length, Anchorage, Cover, Minimum edge thickness requirements as per IS 456- 2000 – Design of Isolated square and rectangular footings. | 12 |

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| 1 | 1 | What is the characteristic strength of M25 concrete?<br>(a) 15 N/mm² (b) 20 N/mm²<br>(c) 25 N/mm² (d) 30 N/mm²<br>**Ans:25 N/mm²** |
| 1 | 2 | What is the unit of characteristic strength in RCC?<br>(a) kg/cm² (b) N/m²<br>(c) N/mm² (d) Pa<br>**Ans:N/mm²** |
| 1 | 3 | Partial safety factor for steel in LSM is:<br>(a) 1 (b) 1.15<br>(c) 1.5 (d) 2<br>**Ans:1.15** |
| 1 | 4 | In LSM, characteristic strength of steel is:<br>(a) 250 MPa (b) 415 MPa<br>(c) 500 MPa (d) Depends on grade<br>**Ans:Depends on grade** |
| 1 | 5 | Limit State Method is based on:<br>(a) Working load theory (b) Elastic limit theory<br>(c) Probability and statistics (d) Plastic analysis<br>**Ans:Probability and statistics** |
| 1 | 6 | The stress-strain curve for mild steel has:<br>(a) A straight line only (b) No yield point<br>(c) A distinct yield plateau (d) No definite slope<br>**Ans:A distinct yield plateau** |
| 1 | 7 | What is the maximum compressive strain in concrete under flexure?<br>(a) 0.002 (b) 0.0025<br>(c) 0.0035 (d) 0.003<br>**Ans:0.0035** |
| 1 | 8 | Which assumption is made in LSM for strain distribution?<br>(a) Linear strain only in steel (b) Plane section remains curved<br>(c) Plane section remains plane (d) Concrete is elastic<br>**Ans:Plane section remains plane** |
| 1 | 9 | What is the design strength of Fe415 steel in LSM?<br>(a) 0.45 x 415 N/mm² (b) 0.67 x 415 N/mm²<br>(c) 415 N/mm² (d) 0.87 × 415 N/mm²<br>**Ans:0.87 × 415 N/mm²** |

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| 1 | 11 | In RCC design as per IS456:2000, tensile strength of concrete is:<br>(a) Fully considered (b) Partially used<br>(c) Neglected (d) Doubled<br>**Ans:Neglected** |
| 1 | 12 | What is the nominal cover for mild exposure conditions in beams?<br>(a) 15 mm (b) 20 mm<br>(c) 25 mm (d) 40 mm<br>**Ans:20 mm** |
| 1 | 13 | In LSM, design load is calculated by multiplying the characteristic load with:<br>(a) Factor of safety (b) Partial safety factor for material<br>(c) Partial safety factor for load (d) Load constant<br>**Ans:Partial safety factor for load** |
| 1 | 14 | Which of the following is considered a limit state of collapse?<br>(a) Cracking (b) Deflection<br>(c) Fatigue (d) Flexure<br>**Ans:Flexure** |
| 1 | 15 | As per LSM, the characteristic strength of a material is:<br>(a) Average of samples (b) Maximum of results<br>(c) Value below which 5% of results fall (d) Value above which 95% of results fall<br>**Ans:Value below which 5% of results fall** |
| 1 | 16 | In LSM, concrete in tension is:<br>(a) Considered fully (b) Ignored<br>(c) Partially used (d) Only used in prestressed concrete<br>**Ans:Ignored** |
| 1 | 17 | The value of partial safety factor for concrete in LSM is:<br>(a) 1.15 (b) 1.25<br>(c) 1.5 (d) 1.65<br>**Ans:1.5** |
| 1 | 18 | In LSM, which of the following is not considered as a serviceability limit state?<br>(a) Deflection (b) Cracking<br>(c) Vibration (d) Collapse<br>**Ans:Collapse** |
| 1 | 19 | In LSM, the design load for a beam subjected to dead and live load is calculated as:<br>(a) 1.5(DL + LL) (b) DL + 1.5LL<br>(c) 1.2(DL + LL) (d) 0.9DL + 1.5LL<br>**Ans:1.5(DL + LL)** |

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| 1 | 21 | The neutral axis depth in an under-reinforced section is:<br>(a) Greater than xu,lim (b) Equal to xu,lim<br>(c) Less than xu,lim (d) Not defined<br>**Ans:Less than xu,lim** |
| 1 | 22 | As per LSM, the maximum depth of neutral axis for Fe500 steel is:<br>(a) 0.43d (b) 0.46d<br>(c) 0.48d (d) 0.46d<br>**Ans:0.46d** |
| 1 | 23 | Which expression gives the ultimate moment capacity of a singly reinforced rectangular under-reinforced section?<br>(a) 0.36fckxubd (b) 0.87fyAstz<br>(c) fck×b×d (d) 0.67fy×Ast×d<br>**Ans:0.87fyAstz** |
| 1 | 24 | The main design objective of LSM is:<br>(a) Minimum steel usage (b) Safety and serviceability<br>(c) Economic sections (d) Elastic behavior<br>**Ans:Safety and serviceability** |
| 1 | 25 | Characteristic load is defined as the load:<br>(a) Which never exceeds (b) Which always acts<br>(c) With 95% probability of not being exceeded (d) Average load<br>**Ans:With 95% probability of not being exceeded** |
| 1 | 26 | In LSM, the factored moment is also referred to as:<br>(a) Ultimate moment (b) Working moment<br>(c) Nominal moment (d) Allowable moment<br>**Ans:Ultimate moment** |
| 1 | 27 | In LSM, to ensure ductile failure, the section should be:<br>(a) Over-reinforced (b) Balanced<br>(c) Under-reinforced (d) Heavily loaded<br>**Ans:Under-reinforced** |
| 1 | 28 | The stress in compression steel is taken as:<br>(a) 0.87fy (b) always fy<br>(c) Depends on strain in steel (d) Zero<br>**Ans:Depends on strain in steel** |
| 1 | 29 | Which expression gives the Moment of Resistance of a singly reinforced rectangular section?<br>(a) 0.36fckxub(d–0.42xu) (b) 0.87fyAstz<br>(c) fck×b×d (d) 0.67fy×Ast×d<br>**Ans:0.36fckxub(d–0.42xu)** |

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| 2 | 1 | The effective span of a simply supported beam as per IS 456 is defined as the lesser of which two values?<br>(a) A) Center-to-center of supports or clear span + effective depth<br>(b) B) Clear span or clear span + effective depth<br>(c) C) Center-to-center of supports or clear span + half of the bearing length<br>(d) D) Clear span + bearing length or clear span + effective depth<br>**Ans:A) Center-to-center of supports or clear span + effective depth** |
| 2 | 2 | Effective span of a cantilever beam is taken as:<br>(a) A) Clear span + effective depth<br>(b) B) Clear span<br>(c) C) Clear span + half effective depth<br>(d) D) Clear span + full bearing length<br>**Ans:C) Clear span + half effective depth** |
| 2 | 3 | The basic span/depth ratio for a simply supported beam for deflection control as per IS 456 is:<br>(a) A) 7<br>(b) B) 20<br>(c) C) 26<br>(d) D) 30<br>**Ans:B) 20** |
| 2 | 4 | For a cantilever beam, the basic span/depth ratio for deflection control is:<br>(a) A) 7<br>(b) B) 10<br>(c) C) 15<br>(d) D) 20<br>**Ans:A) 7** |
| 2 | 5 | The minimum depth requirement for a cantilever beam to satisfy stiffness criteria is span/___?<br>(a) A) 7<br>(b) B) 10<br>(c) C) 15<br>(d) D) 20<br>**Ans:A) 7** |
| 2 | 6 | For beams, the nominal cover to reinforcement for moderate exposure condition is:<br>(a) A) 20 mm<br>(b) B) 25 mm<br>(c) C) 30 mm<br>(d) D) 40 mm<br>**Ans:C) 30 mm** |
| 2 | 7 | The minimum percentage of tension steel in a beam with Fe-415 reinforcement is given by the formula:<br>(a) A) 0.12%<br>(b) B) 0.15%<br>(c) C) 0.2%<br>(d) D) $0.85 \cdot b \cdot d/fy$<br>**Ans:D) $0.85 \cdot b \cdot d/fy$** |
| 2 | 8 | The maximum percentage of tensile steel in a beam is limited to:<br>(a) A) 2%<br>(b) B) 3%<br>(c) C) 4%<br>(d) D) 6%<br>**Ans:C) 4%** |
| 2 | 9 | Side face reinforcement is required when the depth of the web in a beam exceeds:<br>(a) A) 350 mm<br>(b) B) 450 mm<br>(c) C) 500 mm<br>(d) D) 750 mm<br>**Ans:D) 750 mm** |

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| 2 | 11 | In limit state design, the anchorage value of a standard 90° bend is:<br>(a) A) 4 times the diameter of the bar (ϕ) (b) B) 8 times the diameter of the bar (ϕ)<br>(c) C) 16 times the diameter of the bar (ϕ) (d) D) 24 times the diameter of the bar (ϕ)<br>**Ans:B) 8 times the diameter of the bar (ϕ)** |
| 2 | 12 | The anchorage value of a standard hook (bend through 180°) is:<br>(a) A) 8 times the diameter of the bar (ϕ) (b) B) 12 times the diameter of the bar (ϕ)<br>(c) C) 16 times the diameter of the bar (ϕ) (d) D) 24 times the diameter of the bar (ϕ)<br>**Ans:C) 16 times the diameter of the bar (ϕ)** |
| 2 | 13 | The maximum positive bending moment in a simply supported beam under a uniformly distributed load (UDL) is:<br>(a) A) $wl^2/4$ (b) B) $wl^2/8$<br>(c) C) $wl^2/10$ (d) D) $wl^2/12$<br>**Ans:B) $wl^2/8$** |
| 2 | 14 | In a reinforced concrete beam, the minimum clear spacing between adjacent parallel bars in a layer should not be less than:<br>(a) A) The diameter of the largest bar (b) B) 25 mm<br>(c) C) 20 mm + 5 mm (d) D) The nominal maximum size of aggregate + 5 mm<br>**Ans:D) The nominal maximum size of aggregate + 5 mm** |
| 2 | 15 | The limiting neutral axis depth ( xu,max ) for Fe-415 grade steel in limit state design is:<br>(a) A) 0.43d (b) B) 0.46d<br>(c) C) 0.48d (d) D) 0.53d<br>**Ans:C) 0.48d** |
| 2 | 16 | In singly reinforced rectangular beams, the tensile force is assumed to be resisted by:<br>(a) A) Only shear (b) B) Only moment<br>(c) C) The entire bending moment, carried by the tension steel (d) D) Part of the moment and part of the shear<br>**Ans:C) The entire bending moment, carried by the tension steel** |
| 2 | 17 | Compression steel is provided in a doubly reinforced beam primarily to:<br>(a) A) Reduce shear (b) B) Resist additional moment beyond the limit of a singly reinforced section<br>(c) C) Reduce the effective span (d) D) Increase the concrete cover<br>**Ans:B) Resist additional moment beyond the limit of a singly reinforced section** |
| 2 | 18 | In limit state design, the maximum compressive strain in concrete in flexure is:<br>(a) A) 0.002 (b) B) 0.003<br>(c) C) 0.0035 (d) D) 0.004<br>**Ans:C) 0.0035** |
| 2 | 19 | The critical section for shear in a beam is typically taken at what distance from the face of the support?<br>(a) A) At the face of support (b) B) An effective depth (d) from the face of support<br>(c) C) At the mid-span (d) D) At a distance of L/4<br>**Ans:B) An effective depth (d) from the face of support** |

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| 2 | 21 | For a cantilever beam under a uniformly distributed load (w), the maximum shear force at the support is:<br>(a) A) wl (b) B) wl/2<br>(c) C) wl/4 (d) D) wl/8<br>**Ans:A) wl** |
| 2 | 22 | The minimum shear reinforcement in a beam is specified by the ratio of stirrup area to the product of beam width and spacing, as per the formula:<br>(a) A) $Asv/(b \cdot Sv) \geq 0.4/(0.87fy)$ (b) B) $Asv/(b \cdot Sv) \geq 0.2/(0.87fy)$<br>(c) C) $Asv/(b \cdot Sv) \geq 0.85/fy$ (d) D) $Asv/(b \cdot Sv) \geq 0.87/fy$<br>**Ans:A) $Asv/(b \cdot Sv) \geq 0.4/(0.87fy)$** |
| 2 | 23 | The maximum spacing of vertical stirrups in a beam should not exceed:<br>(a) A) 0.5d or 300 mm, whichever is less (b) B) 0.75d or 300 mm, whichever is less<br>(c) C) d or 300 mm, whichever is less (d) D) 0.5d or 200 mm, whichever is less<br>**Ans:B) 0.75d or 300 mm, whichever is less** |
| 2 | 24 | What is the minimum diameter of stirrup bars allowed in RCC beams as per IS 456?<br>(a) A) 6 mm (b) B) 8 mm<br>(c) C) 10 mm (d) D) 12 mm<br>**Ans:A) 6 mm** |
| 2 | 25 | If a beam's shear reinforcement consists of inclined stirrups at 45 degrees, what is the maximum spacing of these bars along the beam's longitudinal axis?<br>(a) A) 0.5d or 300 mm, whichever is less (b) B) 0.75d or 300 mm, whichever is less<br>(c) C) d or 300 mm, whichever is less (d) D) 0.5d or 200 mm, whichever is less<br>**Ans:C) d or 300 mm, whichever is less** |
| 2 | 26 | The design shear strength of concrete ( $\tau c$ ) increases with an increase in:<br>(a) A) Percentage of tensile steel (b) B) Grade of steel<br>(c) C) Beam depth (d) D) Beam span<br>**Ans:A) Percentage of tensile steel** |
| 2 | 27 | The maximum permissible shear stress ( $\tau c,max$ ) for M20 grade concrete is:<br>(a) A) 1.8 $N/mm^2$ (b) B) 2.8 $N/mm^2$<br>(c) C) 3.1 $N/mm^2$ (d) D) 3.5 $N/mm^2$<br>**Ans:B) 2.8 $N/mm^2$** |
| 2 | 28 | The primary function of shear reinforcement in beams is to resist:<br>(a) A) Flexural stresses (b) B) Torsional moment<br>(c) C) Diagonal tension stresses (d) D) Axial compressive load<br>**Ans:C) Diagonal tension stresses** |
| 2 | 29 | The shear strength of concrete is independent of which of the following parameters?<br>(a) A) Grade of concrete (b) B) Percentage of tensile steel<br>(c) C) Shear span (d) D) Breadth of section<br>**Ans:C) Shear span** |

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| 3 | 1 | In a T-beam or L-beam, the slab can be considered as a compression flange only if :<br>(a) The slab is simply supported on the web<br>(b) The slab is cast separately from the web<br>(c) The slab is cast integrally with the web or effectively bonded<br>(d) The slab is cast after placing the beam<br>**Ans:The slab is cast integrally with the web or effectively bonded** |
| 3 | 2 | What is the effective flange width of a T-beam according to IS : 456 -2000 ?<br>(a) lo/3+bw+6Df<br>(b) lo/6+bw+6Df<br>(c) lo/3+bw+3Df<br>(d) lo/12+bw+3Df<br>**Ans:lo/6+bw+6Df** |
| 3 | 3 | What is the effective flange width of an isolated T-beam according to IS:456 - 2000?<br>(a) lo/(lo/b+4)+bw<br>(b) lo/6+bw+6Df<br>(c) 0.5lo/(lo/b+4)+bw<br>(d) lo/12+bw+3Df<br>**Ans:lo/(lo/b+4)+bw** |
| 3 | 4 | What is the effective flange width of a L-beam according to IS : 456 -2000 ?<br>(a) lo/3+bw+6Df<br>(b) lo/6+bw+6Df<br>(c) lo/3+bw+3Df<br>(d) lo/12+bw+3Df<br>**Ans:lo/12+bw+3Df** |
| 3 | 5 | What is the effective flange width of a isolated L-beam according to IS:456 - 2000?<br>(a) lo/(lo/b+4)+bw<br>(b) lo/6+bw+6Df<br>(c) 0.5lo/(lo/b+4)+bw<br>(d) lo/12+bw+3Df<br>**Ans:0.5lo/(lo/b+4)+bw** |
| 3 | 6 | What does lo represent in the effective width of flange formula for T-beam or L-beam?<br>(a) Length of flange<br>(b) Span of beam<br>(c) Distance between points of zero moment<br>(d) Clear cover<br>**Ans:Distance between points of zero moment** |
| 3 | 7 | For continuous beams, IS 456 suggests that lo may be taken as<br>(a) Full span<br>(b) 0.8 × effective span<br>(c) 0.7 × effective span<br>(d) 0.5 × effective span<br>**Ans:0.7 × effective span** |
| 3 | 8 | In the T-beam formula, what is the maximum allowed value of bf?<br>(a) Any calculated value<br>(b) Twice the web width<br>(c) Should not exceed the actual flange width<br>(d) Equal to effective span<br>**Ans:Should not exceed the actual flange width** |
| 3 | 9 | In a T-beam, the part that resists compression is :<br>(a) Web<br>(b) Flange<br>(c) Stirrups<br>(d) Bottom reinforcement<br>**Ans:Flange** |

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| 3 | 11 | The moment of resistance of a singly reinforced T-beam is calculated using:<br>(a) Area of compression steel (b) Lever arm and tension steel<br>(c) Effective width of flange (d) Total beam width<br>**Ans:Effective width of flange** |
| 3 | 12 | In T-beam, if neutral axis lies in flange, the section is treated as :<br>(a) Circular (b) Rectangular<br>(c) Flanged (d) Doubly reinforced<br>**Ans:Rectangular** |
| 3 | 13 | In T-Beam / L-Beam main reinforcement of the slab is said to be parallel to the beam when:<br>(a) It is placed perpendicular to the web (b) It runs in the same direction as the beam's span<br>(c) It crosses the beam diagonally (d) It is placed only in the transverse direction<br>**Ans:It runs in the same direction as the beam's span** |
| 3 | 14 | In T-Beam / L-Beam transverse reinforcement provided in the slab, as per IS 456, shall not be less than:<br>(a) 40% of the main reinforcement at midspan (b) 75% of the midspan reinforcement<br>(c) 60% of the main reinforcement at midspan (d) Equal to the main reinforcement<br>**Ans:60% of the main reinforcement at midspan** |
| 3 | 15 | The transverse reinforcement in flange of T-beam should extend on each side of the web up to:<br>(a) l (b) l/4<br>(c) l/8 (d) l/3<br>**Ans:l/4** |
| 3 | 16 | While designing continuous beams for hogging moment at support, reinforcement is placed<br>(a) At bottom (b) Both top and bottom<br>(c) At Top (d) At Neutral Axis<br>**Ans:At Top** |
| 3 | 17 | Analysis of Continuous Beam can be done by<br>(a) Moment Distribution Method (b) Clapeyron's Three Moment Theorem<br>(c) Slope – Deflection Method (d) All of the Options<br>**Ans:All of the Options** |
| 3 | 18 | As per IS 456:2000, for continuous beams or slabs, if support width is less than 1/12 of clear span, the effective span is:<br>(a) Clear span + Effective Depth (b) Centre-to-centre of supports<br>(c) Lesser Of (A) & (B) (d) Greater Of (A) & (B)<br>**Ans:Lesser Of (A) & (B)** |
| 3 | 19 | As per IS 456:2000, for continuous beams or slabs, if support width is wider than 1/12 of clear span (Or) 600mm 'whichever less', For end span with one end fixed and the other continuous or intermediate spans, the effective span is<br>(a) Average of support widths (b) Centre-to-centre distance<br>(c) Clear span between supports (d) Not defined<br>**Ans:Clear span between supports** |

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|---|---|---|
| 3 | 21 | As per IS 456:2000, for continuous beams or slabs, if support width is wider than 1/12 of clear span (Or) 600mm 'whichever less', In the case of roller or rocker bearings, the effective span is taken as<br>(a) Clear span (b) Overall length<br>(c) Width of beam (d) Distance between centres of bearings<br>**Ans:Distance between centres of bearings** |
| 3 | 22 | What is the bending moment coefficient at mid-span of interior span for dead load and imposed load (fixed)<br>(a) + 1/16 (b) - 1/16<br>(c) + 1/10 (d) +1/9<br>**Ans:+ 1/16** |
| 3 | 23 | For imposed load (not fixed), the coefficient for span moment near middle of end span is:<br>(a) + 1/16 (b) - 1/16<br>(c) + 1/10 (d) - 1/10<br>**Ans:+ 1/10** |
| 3 | 24 | In case of a continuous beam, the maximum bending moment occurs at, as per IS456 :2000?<br>(a) mid of end span (b) a support next to end support<br>(c) At Support (d) other interior support<br>**Ans:a support next to end support** |
| 3 | 25 | For a continuous beam, maximum shear force occurs<br>(a) At supports (b) At mid-span<br>(c) At quarter - span (d) At point of inflection<br>**Ans:At supports** |
| 3 | 26 | As per IS456 : 2000, for a continuous beam the Shear coefficient at end support due to dead load & imposed load (fixed) will be:<br>(a) 0.4 (b) 0.45<br>(c) 0.5 (d) 0.6<br>**Ans:0.4** |
| 3 | 27 | As per IS456 : 2000, for a continuous slab/beam the Shear coefficient at Outer side of support next to end support due to dead load & imposed load (fixed) will be:<br>(a) 0.6 (b) 0.5<br>(c) 0.45 (d) 0.55<br>**Ans:0.6** |
| 3 | 28 | As per IS456 : 2000, for a continuous slab/beam the Shear coefficient at inner side of support next to end support due to dead load and imposed load (fixed) will be<br>(a) 0.6 (b) 0.55<br>(c) 0.45 (d) 0.5<br>**Ans:0.55** |
| 3 | 29 | As per IS456 : 2000 for a continuous beam the bending moment near middle of end span due to dead load and imposed load (fixed) will be :<br>(a) +wul2/10 (b) +wul2/12<br>(c) −wul2/10 (d) −wul2/12<br>**Ans:+wul2/12** |

| U.NO | Q NO | QUESTIONS |
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| 4 | 1 | A one-way slab bends primarily in which direction?<br>(a) Both directions (b) Shorter span direction<br>(c) Longer span direction (d) Diagonal direction<br>**Ans:Shorter span direction** |
| 4 | 2 | As per IS 456:2000, the slab is considered one-way if the ratio of longer span to shorter span is greater than:<br>(a) 1.5 (b) 2<br>(c) 2.5 (d) 1<br>**Ans:2** |
| 4 | 3 | The effective depth of a simply supported one-way slab, considering vertical deflection criteria, as per IS 456:2000 should not be less than:<br>(a) L/30 (b) L/20<br>(c) L/25 (d) L/15<br>**Ans:L/20** |
| 4 | 4 | The main reinforcement in a one-way slab is provided in:<br>(a) Both directions equally (b) Perpendicular to the shorter span<br>(c) Along the longer span (d) Along the shorter span<br>**Ans:Along the shorter span** |
| 4 | 5 | The minimum clear cover for a slab exposed to moderate conditions (for durability criteria) should be:<br>(a) 15 mm (b) 25 mm<br>(c) 20 mm (d) 30 mm<br>**Ans:30 mm** |
| 4 | 6 | In a one-way slab, the distribution steel is provided to:<br>(a) Carry bending moment (b) Resist torsion<br>(c) Control temperature and shrinkage stresses (d) Provide shear resistance<br>**Ans:Control temperature and shrinkage stresses** |
| 4 | 7 | The maximum spacing of main reinforcement in a one-way slab shall not exceed the lesser of:<br>(a) 3d or 300 mm (b) 3d or 450 mm<br>(c) 3d or 500 mm (d) 3d or 250 mm<br>**Ans:3d or 300 mm** |
| 4 | 8 | Effective span of a simply supported one-way slab is:<br>(a) Clear span + depth (b) Clear span – half width of support<br>(c) Lesser of (clear span + effective depth) or center-to-center of supports (d) Clear span only<br>**Ans:Lesser of (clear span + effective depth) or center-to-center of supports** |
| 4 | 9 | Minimum percentage of tension reinforcement for slab (Fe415) as per IS 456 is:<br>(a) 0.12% (b) 0.15%<br>(c) 0.10% (d) 0.25%<br>**Ans:0.0012** |

| U.NO | Q NO | QUESTIONS |
|---|---|---|
| 4 | 11 | Distribution steel is placed in which direction in one-way slab?<br>(a) Longer span (b) Shorter span<br>(c) Diagonal (d) Vertical<br>**Ans:Longer span** |
| 4 | 12 | The maximum spacing of distribution bars in one-way slab is:<br>(a) 3d or 300 mm (b) 3d or 450 mm<br>(c) 5d or 300 mm (d) 5d or 500 mm<br>**Ans:5d or 300 mm** |
| 4 | 13 | The effective span of a slab simply supported on walls is:<br>(a) Clear span plus effective depth (b) Center-to-center distance of support<br>(c) Lesser of (A) and (B) (d) Greater of (A) and (B)<br>**Ans:Lesser of (A) and (B)** |
| 4 | 14 | Bending moment in simply supported one-way slab under UDL =<br>(a) $wL^2/8$ (b) $wL^2/12$<br>(c) $wL^2/16$ (d) $wL^2/10$<br>**Ans:$wL^2/8$** |
| 4 | 15 | The one-way slab primarily resists:<br>(a) Shear (b) Axial load<br>(c) Bending (d) Torsion<br>**Ans:Bending** |
| 4 | 16 | Slab thickness is usually governed by:<br>(a) Ultimate moment (b) Deflection control<br>(c) Steel cost (d) Dead load<br>**Ans:Deflection control** |
| 4 | 17 | Which type of reinforcement is called the main reinforcement in a one-way slab?<br>(a) Top reinforcement supported along the longer span (b) Bottom reinforcement provided in the shorter span direction<br>(c) Top reinforcement provided in the transverse direction (d) Bottom reinforcement placed in the longer span direction<br>**Ans:Bottom reinforcement provided in the shorter span direction** |
| 4 | 18 | The minimum percentage of secondary steel in slabs for Fe-415 grade steel should be of gross cross-section area.<br>(a) 0.25% (b) 0.15%<br>(c) 0.12% (d) 0.20%<br>**Ans:0.0012** |
| 4 | 19 | In two-way slabs, the bending occurs:<br>(a) Only in shorter direction (b) Only in longer direction<br>(c) In both directions (d) In diagonal direction<br>**Ans:In both directions** |

| U.NO | Q NO | QUESTIONS |
|---|---|---|
| 4 | 21 | The minimum thickness of a two-way slab as per IS 456:2000 is based on:<br>(a) Span/depth ratio (b) Bending moment<br>(c) Shear force (d) Torsion<br>**Ans:Span/depth ratio** |
| 4 | 22 | The distribution of loads from slab to beam is determined using:<br>(a) Yield line theory (b) Rankine method<br>(c) Moment distribution method (d) Moment coefficients from IS 456:2000<br>**Ans:Yield line theory** |
| 4 | 23 | In a two-way slab, torsional reinforcement is provided at:<br>(a) Edges (b) Center<br>(c) Corners (d) Mid-span<br>**Ans:Corners** |
| 4 | 24 | For effective distribution of loads in a two-way slab, the slab must be supported on:<br>(a) Two sides only (b) Four sides<br>(c) Three sides (d) One side<br>**Ans:Four sides** |
| 4 | 25 | As per IS 456:2000, the maximum spacing of main reinforcement in a two-way slab shall not exceed:<br>(a) 300 mm (b) 450 mm<br>(c) 3d or 300 mm (d) 3d or 450 mm<br>**Ans:3d or 300 mm** |
| 4 | 26 | The minimum clear cover to main reinforcement in a slab is:<br>(a) 20 mm (b) 25 mm<br>(c) 30 mm (d) 40 mm<br>**Ans:20 mm** |
| 4 | 27 | Which IS code gives design guidelines for design of slabs?<br>(a) IS 875 (b) IS 456:2000<br>(c) IS 3370 (d) IS 800<br>**Ans:IS 456:2000** |
| 4 | 28 | The main reinforcement in a two-way slab runs along:<br>(a) Both directions (b) Shorter direction only<br>(c) Longer direction only (d) Diagonal direction<br>**Ans:Both directions** |
| 4 | 29 | If corners of a slab are prevented from lifting, torsion bars are:<br>(a) Provided (b) Not required<br>(c) Doubled (d) Ignored<br>**Ans:Provided** |

| U.NO | Q NO | QUESTIONS |
|---|---|---|
| 5 | 1 | The failure of a column due to axial compression is classified as what in limit state design according to IS 456:2000?<br>(a) Limit state of serviceability (b) Limit state of collapse in compression<br>(c) Limit state of durability (d) Limit state of deflection<br>**Ans:Limit state of collapse in compression** |
| 5 | 2 | What is the maximum strain in concrete at the highly compressed extreme fibre in an axially loaded column as per IS 456:2000?<br>(a) 0.002 (b) 0.003<br>(c) 0.0035 (d) 0.004<br>**Ans:0.002** |
| 5 | 3 | A column is considered a short column if its slenderness ratio (effective length to least lateral dimension) is less than or equal to:<br>(a) 10 (b) 12<br>(c) 15 (d) 20<br>**Ans:12** |
| 5 | 4 | A column with an unsupported length of 3 m and a least lateral dimension of 300 mm, if both ends are hinged, is classified as:<br>(a) Short (b) Slender<br>(c) Long (d) Intermediate<br>**Ans:Short** |
| 5 | 5 | The slenderness ratio of a column is the ratio of its:<br>(a) Effective length to its overall depth (b) Overall length to its least lateral dimension<br>(c) Effective length to its least lateral dimension (d) Overall length to its breadth<br>**Ans:Effective length to its least lateral dimension** |
| 5 | 6 | For a column, the minimum eccentricity is the lesser of 20 mm and:<br>(a) unsupported length/300 + b/30 (b) unsupported length/400 + b/30<br>(c) unsupported length/500 + b/30 (d) unsupported length/300 + b/50<br>**Ans:unsupported length/500 + b/30** |
| 5 | 7 | What is the minimum percentage of longitudinal reinforcement in a column?<br>(a) 0.6% of gross cross-sectional area (b) 0.8% of gross cross-sectional area<br>(c) 1.0% of gross cross-sectional area (d) 1.2% of gross cross-sectional area<br>**Ans:0.8% of gross cross-sectional area** |
| 5 | 8 | A column is considered to be subjected to an axial load if the eccentricity is less than or equal to:<br>(a) 0.05 times the least lateral dimension (b) 0.10 times the least lateral dimension<br>(c) 0.15 times the least lateral dimension (d) 0.20 times the least lateral dimension<br>**Ans:0.05 times the least lateral dimension** |
| 5 | 9 | The maximum percentage of longitudinal reinforcement in a column is limited to:<br>(a) 4% (b) 6%<br>(c) 8% (d) 10%<br>**Ans:0.06** |

| U.NO | Q NO | QUESTIONS |
|---|---|---|
| 5 | 11 | The diameter of the lateral ties for a column should not be less than:<br>(a) 1/4 of the largest longitudinal bar diameter (b) 1/3 of the largest longitudinal bar diameter<br>(c) 1/2 of the largest longitudinal bar diameter (d) 1/6 of the largest longitudinal bar diameter<br>**Ans:1/4 of the largest longitudinal bar diameter** |
| 5 | 12 | What is the minimum concrete cover for a column?<br>(a) 20 mm or bar diameter (b) 25 mm or bar diameter<br>(c) 40 mm or bar diameter (d) 50 mm or bar diameter<br>**Ans:40 mm or bar diameter** |
| 5 | 13 | What is the primary function of a footing in a structure?<br>(a) To resist shear force (b) To transfer the load from the column to the subsoil<br>(c) To resist bending moment (d) To provide an aesthetic base for the column<br>**Ans:To transfer the load from the column to the subsoil** |
| 5 | 14 | A combined footing is required when:<br>(a) A single column load is very large (b) Columns are widely spaced<br>(c) Two or more columns are close to each other (d) The soil has a very high bearing capacity<br>**Ans:Two or more columns are close to each other** |
| 5 | 15 | For the design of a footing for bending moment, the critical section is considered at the:<br>(a) Face of the column (b) Centerline of the column<br>(c) A distance of effective depth 'd' from the column face (d) A distance of d/2 from the column face<br>**Ans:Face of the column** |
| 5 | 16 | For the design of a footing for one-way shear, the critical section is considered at a distance of:<br>(a) d from the face of the column (b) d/2 from the face of the column<br>(c) The face of the column (d) The centerline of the column<br>**Ans:d from the face of the column** |
| 5 | 17 | For the design of a footing for punching shear, the critical section is considered at a distance of:<br>(a) d/2 from the face of the column (b) d from the face of the column<br>(c) The face of the column (d) The centerline of the column<br>**Ans:d/2 from the face of the column** |
| 5 | 18 | The minimum percentage of tension reinforcement in a footing slab is:<br>(a) 0.12% for Fe-415 steel and 0.15% for Fe-250 steel (b) 0.15% of the total cross-sectional area<br>(c) 0.20% of the total cross-sectional area (d) 0.40% of the total cross-sectional area<br>**Ans:0.12% for Fe-415 steel and 0.15% for Fe-250 steel** |
| 5 | 19 | What is the main purpose of a pedestal in a column footing?<br>(a) To reduce the size of the footing (b) To increase the shear strength of the footing<br>(c) To transfer the column load to the footing (d) To prevent the column from sliding<br>**Ans:To transfer the column load to the footing** |

| U.NO | Q NO | QUESTIONS |
|---|---|---|
| 5 | 21 | The term "contact pressure" in footing design refers to the pressure:<br>(a) Applied by the column (b) Resisted by the reinforcement<br>(c) Exerted by the footing on the soil (d) Applied by the dead load only<br>**Ans:Exerted by the footing on the soil** |
| 5 | 22 | Which of the following is not a type of R.C.C. footing?<br>(a) Isolated footing (b) Combined footing<br>(c) Strap footing (d) Pile footing<br>**Ans:Pile footing** |
| 5 | 23 | Development length is provided in footings to ensure:<br>(a) Proper load transfer from steel to concrete (b) Resistance to punching shear<br>(c) Resistance to bending moment (d) Proper spacing of bars<br>**Ans:Proper load transfer from steel to concrete** |
| 5 | 24 | Anchorage value of a standard hook for reinforcement in a footing is:<br>(a) 8$\phi$ (b) 12$\phi$<br>(c) 16$\phi$ (d) 24$\phi$<br>**Ans:16$\phi$** |
| 5 | 25 | According to IS 456:2000, what is the minimum concrete cover for reinforcement in a footing?<br>(a) 25 mm (b) 40 mm<br>(c) 50 mm (d) 75 mm<br>**Ans:50 mm** |
| 5 | 26 | The minimum edge thickness of a footing with uniform thickness should not be less than:<br>(a) 100 mm (b) 150 mm<br>(c) 200 mm (d) 250 mm<br>**Ans:150 mm** |
| 5 | 27 | The main purpose of providing a minimum edge thickness for a footing is to:<br>(a) Prevent curling of the edges (b) Accommodate the bending moment at the edges<br>(c) Ensure adequate cover and proper concrete placement (d) Reduce the overall weight of the footing<br>**Ans:Ensure adequate cover and proper concrete placement** |
| 5 | 28 | What type of shear is checked first when designing a footing?<br>(a) One-way shear (b) Two-way shear<br>(c) Punching shear (d) Both one-way and two-way shear<br>**Ans:Both one-way and two-way shear** |
| 5 | 29 | The bearing capacity of the soil is typically assumed to be uniform under a centrally loaded footing. This is known as:<br>(a) Uniform stress distribution (b) Uniform pressure distribution<br>(c) Safe bearing capacity (d) Allowable stress<br>**Ans:Uniform pressure distribution** |

## 3 MARK QUESTIONS

| UNIT | Q.NO | QUESTIONS |
|---|---|---|
| 1 | 1 | What is the main purpose of providing reinforcement in reinforced cement concrete? |
| 1 | 2 | List two advantages of the Limit State Method of design over the Working Stress Method. |
| 1 | 3 | Why are under reinforced sections preferred over over reinforced sections? |
| 1 | 4 | What is the purpose of providing different grades of concrete, and what do these grades signify? |
| 1 | 5 | What is the definition of characteristic strength of concrete as per IS 456-2000? |
| 1 | 6 | Differentiate between the concept of characteristic strength and design strength of materials. |
| 1 | 7 | Define the term "Limit State" in the context of structural design. |
| 1 | 8 | Why are partial safety factors for loads and materials essential in the Limit State Method? |
| 1 | 9 | What is the role of the neutral axis in a reinforced concrete beam, and how is its limiting value determined? |
| 1 | 10 | A doubly reinforced concrete beam has a width of 300 mm and a total depth of 550 mm. The clear cover is 30 mm. Calculate the effective depth (d) and effective cover (d'). |
| 2 | 1 | Explain the calculation of effective span for a simply supported beam as per IS 456-2000. |
| 2 | 2 | According to IS 456-2000, what is the the minimum area of tension steel required for rectangular beams? |
| 2 | 3 | What is the main purpose of controlling deflection in reinforced concrete beams? |
| 2 | 4 | State the codal provisions as per IS 456-2000 for providing side face reinforcement in beams. |
| 2 | 5 | Explain the significance of providing development length for reinforcement bars. |
| 2 | 6 | What are the different types of bends/hooks provided in reinforcements? |
| 2 | 7 | Why is curtailment of reinforcement necessary in reinforced concrete beams? |
| 2 | 8 | What are the critical sections for shear in a reinforced concrete beam as per IS 456-2000? |
| 2 | 9 | How is nominal shear stress it calculated in a reinforced concrete beam? |
| 2 | 10 | State the minimum shear reinforcement required in a beam as per IS 456-2000. |
| 3 | 1 | Define the 'effective width of flange' in a T-beam as per IS 456:2000. |
| 3 | 2 | List the criteria that the slab which is assumed to act as a compression flange of a T-beam or L-beam should satisfy as per IS 456:2000. |
| 3 | 3 | State the formula to calculate the moment of resistance of a T-beam when the neutral axis lies within the flange. |
| 3 | 4 | Draw a simple floor plan and mark the possible locations of L-beams. |
| 3 | 5 | Sketch a typical cross section of a T-beam with stirrups and logitudinal reinforcements. |

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| 3 | 6 | In a T-beam, what is the role of the transverse reinforcement provided in the flange? |
| 3 | 7 | How to calculate shear strength of a T-beam? |
| 3 | 8 | What is the primary purpose of analyzing a continuous beam using the coefficient method? |
| 3 | 9 | Define the 'effective span' of a continuous beam as per IS 456:2000. |
| 3 | 10 | Why is it necessary to consider different arrangements of live loads on a continuous beam? |
| 4 | 1 | Define one-way and two-way slabs based on their span-to-span ratios and load transfer mechanisms. |
| 4 | 2 | What is the minimum required area of main reinforcement for a slab as per IS 456-2000? |
| 4 | 3 | How to calculate the 'effective span' for a simply supported one-way slab. |
| 4 | 4 | What is the significance of the Bending Moment coefficients given in IS:456-2000 for continuous slabs? |
| 4 | 5 | What is the maximum spacing of main reinforcement specified in IS456-2000? |
| 4 | 6 | A slab has effective spans of 4120mm and 5120 mm. Check whether the slab is one-way or two-way slab. |
| 4 | 7 | Give the basic values of span to effective depth ratios for different types of slabs. |
| 4 | 8 | State the purpose of providing distribution reinforcement in one-way slabs. |
| 4 | 9 | How is the thickness of a slab determined to meet strength and stiffness requirements? |
| 4 | 10 | Differentiate between a simply supported and a continuous two-way slab. |
| 5 | 1 | Define a 'short column' as per IS 456:2000 in terms of its effective length and lateral dimension. |
| 5 | 2 | A RC column of effective length 3m and cross-section 400mmx500mm. Check if the column can be designed as a short column. |
| 5 | 3 | What is the minimum eccentricity (emin) stipulated by IS 456:2000 for column design? |
| 5 | 4 | State the minimum percentage of longitudinal reinforcement required for a compression member as per IS 456:2000. |
| 5 | 5 | What is the maximum pitch (spacing) allowed for lateral ties in a column, as per IS 456:2000? |
| 5 | 6 | What is the minimum diameter of lateral ties stipulated by IS 456:2000? |
| 5 | 7 | State the minimum nominal cover requirement for reinforcement in a column exposed to mild exposure conditions. |
| 5 | 8 | List the three main types of reinforced concrete footings. |
| 5 | 9 | For an isolated footing, where is the critical section for calculating bending moment? |
| 5 | 10 | Where is the critical section for checking one-way (transverse) shear in a footing? |

# 10 MARK QUESTIONS

| UNIT | Q.NO | QUESTIONS |
|---|---|---|
| 1 | 1 | A Rectangular RCC beam of M20 grade concrete is 250 mm wide and 500mm deep to the centre of the steel. It is reinforced with 3 nas of 20mm dia M S rods in tension zone only. Calculate the Moment of Resistance of the section, by Limit state of collapse. |
| 1 | 2 | A Rectangular cross section of 350mm x 520 mm (overall) is reinforced with 4 nos of 20 mm dia, Fe 415 grade steel rods at effective cover of 40 mm in Tension zone. If the concrete is M20 grade, find out M.R of the beam section at the limit state of collap |
| 1 | 3 | A Rectangular beam of size 300 mm x 400mm is reinforced with 4 nos of 16 mm dia rods at effective cover of 50 mm. If M15 & Fe 415 grades are used, find Ultimate Moment of Resistance in the limit state of collapse. Find also the safe load that the beam ca |
| 1 | 4 | A simply supported rectangular beam of size 250mm x 550 mm Overall size is reinforced with 4 nos 20 mm diameter bars at a clear cover of 35 mm. If the effective span of the beam is 5m, find the load carrying capacity of the beams excluding its self-weight |
| 1 | 5 | A simply supported singly reinforced rectangular beam of overall size 300 mm x 500 mm is reinforced with 4 numbers of 16 mm mild steel bars with an effective cover of 40 mm. It has to carry an udl of 18 kN/m over an effective span of 5m. The concrete use |
| 2 | 1 | A simply supported R.C rectangular beam has an effective depth of 600mm and breath of 400 mm. The beam is reinforced with 3 bars of 22 mm dia. As tension reinforcement at support. The beam is subjected to a factored shear force of 200 kN at support. Chec |
| 2 | 2 | A simply supported R.C rectangular beam has an effective depth of 300mm and breath of 200 mm. The beam is reinforced with 3 bars of 22 mm dia. As tension reinforcement at support. The beam is subjected to a factored shear force of 50 kN at support. Check |
| 2 | 3 | A reinforced concrete beam of 250 mm wide and 400 mm deep effective is subjected to factored shear force of 200 kN at supports. The tensile reinforcement at support is 0.5%. Find the spacing of 10 mm dia. 2-legged stirrups to resist the shear at support. |
| 2 | 4 | A simply supported beam of effective span 6m and M20 grade concrete carries of udl of 35 KN/m. The overall size of the beam is 230x500 mm. It has 6 bars in the tension zone and 4 bars in comp. zone, all are 16 mm dia, Fe 415 steel without any curtailment |
| 2 | 5 | A simply supported beam of effective span 8m and M20 grade concrete carries of udl of 15 KN/m. The overall size of the beam is 200x600 mm. It has 4 bars in the tension zone and 4 bars in comp. zone, all are 16 mm dia, Fe 415 steel without any curtailment |
| 3 | 1 | A 'T' beam has a flange of 1280 mm x 100 mm, effective depth of 700 mm and breath of web is 280 mm. It is reinforced with 5 Nos. of 25 mm Fe 500 grade steel bars in the tension zone. M15 grade concrete is used. Determine the M.R of the section at the limi |
| 3 | 2 | Determine the moment of resistance of the given R.C. T- beam at the limit state of collapse in flexure. The overall size of flange is 1500 x 100mm and that of web is 300 mm x 500 mm . Six numbers of 25 mm dia. And Fe 500 grade steel bars are. Provided as |

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| 3 | 3 | A single reinforced T beam has a flange width of 1400 mm flange thickness of 120 mm. It is reinforced with 4 nos of 20 mm dia bars Fe 415 steel at an effective depth of 450 m. The breadth of web is 230 mm. Concrete grade is M20. Find the limiting M.R of |
| 3 | 4 | Design a simply Supported 'T'beam of clear span 7 m and spaced at 3m centres, the thickness of slab is 100mm, the total characteristic load including the self-weight of the beam is 30 kN/m. the overall size of the beam is 230 mm x 600mm. Use M20 concrete |
| 3 | 5 | Design 'T' beam with simply supported at its both ends to carry a live load of 20 kN/m and super imposed load (dead load) of 16 KN/m clear span of am. over a clear span of 9m.The width and overall depth of the beam are 360 mm and 600 mm respectively. Use |
| 4 | 1 | Design a one way slab for a room of size 3mx7m. The live load is 3.5 kN/ m², the floor finish is 1kN/m². Width of Support is 230mm. Use M15 & Fe 415 grades. |
| 4 | 2 | Design a one way slab for a room of size 2mx6m. The live load is 3 kN/ m², the floor finish is 1kN/m². Width of Support is 200mm. Use M15 & Fe 415 grades |
| 4 | 3 | Design a two-way slab to be supported by brick walls of 200 mm width on all four sides. The clear dimensions of the room is 3m x 5m. Assume the total design load including self weight of the slab is 6 kN/m², grades of concrete and steel are M15 and Fe 250 |
| 4 | 4 | Design a two-way slab to be supported by brick walls of 200 mm width on all four sides. The clear dimensions of the room is 2m x 3m. Assume the total design load including self weight of the slab is 5.74 kN/m², grades of concrete and steel are M15 and Fe |
| 4 | 5 | Design a slab for a room of size 3mx4m. The live load is 3 kN/ m², the floor finish is 1kN/m². Use M15 & Fe 415 grades. Assume the corners ale held down. |
| 5 | 1 | A RC Column 250 mm x 250 mm size has 4 mild steel bars of 16 mm diameter one at each corner. The effective length of the Column is 2.75 m. The Concrete is of M20 grade Determine the strength of column at limit state of collapse. |
| 5 | 2 | A rectangular R.C column 400 mm x300 mm is subjected to a load of 800 kN at an eccentricity of 15 mm with its major axis. The column is hinged at both ends and having a length of 2.5 m. The column is reinforced with 6 numbers of 20mm dia Fe 415 ro |
| 5 | 3 | A 400 mm x 300mm RC Column, 4m long effectively held in position at both ends and restrained against rotation at one end is required to carry an axial load of 900 KN. Design the Column with lateral ties. M20 Concrete and Fe 415 steel used. |
| 5 | 4 | Design a short square column using M20 grade concrete and Fe415 steel to carry an axial load of 2000 KN by limit state method. |
| 5 | 5 | Design a rectangular RC column of side ratio 1.5 to carry an axial load of 900 kN using M25 grade concrete and F.500 grade steel. Assume the column as a short column, the area of longitudinal reinforcement shall not exceed 2% of the gross area |