| JHARSUGUDA ENGINEERING SCHOOL, JHARSUGUDA | | | |
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| Department of Civil Engineering | | | |
| 4th Sem (2nd Year) Summer 2024 | | | |
| Theory No: | 1 | Name of The Faculty: Sri Swapnashish Patel, Sri Soubhagya Ranjan Mohanty | |
| Subject: | STRUCTURAL DESIGN – I | | |
| Sl No | Chapter No | No. Of Classes Scheduled | Topics to be covered |
| 1 | 1 | 1 | 1.Working stress method (WSM) 1.1 Objectives of design and detailing. State the different methods of design of concrete structures. |
| 2 | | 1 | 1.2 Introduction to reinforced concrete, R.C. sections their behavior, grades of concrete and steel. Permissible stresses, assumption in W.S.M. |
| 3 | | 1 | 1.3 Flexural design and analysis of single reinforced sections from first principles. |
| 4 | | 1 | 1.4 Concept of under reinforced, over reinforced and balanced sections. . |
| 5 | | 1 | Revision |
| 6 | | 1 | Revision |
| 7 | | 1 | Practice on Problems |
| 8 | | 1 | Practice on Problems |
| 9 | | 1 | Practice on Problems |
| 10 | | 1 | 1.5 Advantages and disadvantages of WSM, reasons for its obsolescence |
| 11 | 2 | 1 | 2.Philosophy Of Limit State Method (LSM)2.1 Definition, Advantages of LSM over WSM, |
| 12 | | 1 | IS code suggestions regarding design philosophy. |
| 13 | | 1 | 2.2 Types of limit states, partial safety factors for materials strength, |
| 14 | | 1 | characteristic strength, characteristic load, design load, loading on structure as per I.S. 875 |
| 15 | | 1 | Revision |
| 16 | | 1 | Revision |
| 17 | | 1 | Practice on Problems |
| 18 | | 1 | Practice on Problems |

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| 19 | | 1 | 2.3 Study of I.S specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing, minimum reinforcement in slab, beam & column, lapping, anchorage, effective span for beam & slab. . |
| 20 | | 1 | Revision |
| 21 | | 1 | Revision |
| 22 | | 1 | Practice on Problems |
| 23 | | 1 | Practice on Problems |
| 24 | | 1 | 3. Analysis and Design of Single and Double Reinforced Sections (LSM)3.1 Limit state of collapse (flexure), Assumptions, |
| 25 | | 1 | Stress-Strain relationship for concrete and steel, |
| 26 | | 1 | neutral axis, stress block diagram and strain diagram for singly reinforced section |
| 27 | | 1 | Revision |
| 28 | | 1 | Revision |
| 29 | | 1 | Practice on Problems |
| 30 | | 1 | Practice on Problems |
| 31 | 3 | 1 | 3.2 Concept of under- reinforced, over-reinforced and limiting section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section. |
| 32 | | 1 | 3.3 Analysis and design: determination of design constants, moment of resistance and area of steel for rectangular sections |
| 33 | | 1 | 3.4 Necessity of doubly reinforced section, design of doubly reinforced rectangular section |
| 34 | | 1 | Revision |
| 35 | | 1 | Revision |
| 36 | | 1 | Practice on Problems |
| 37 | | 1 | Practice on Problems |
| 38 | | 1 | 4.Shear, Bond and Development Length (LSM) |

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| 39 | 4 | 1 | 4.1 Nominal shear stress in R.C. section, design shear strength of concrete, maximum shear stress, design of shear reinforcement, minimum shear reinforcement, forms of shear reinforcement. |
| 40 | | 1 | 4.2 Bond and types of bond, bond stress, check for bond stress, development length in tension and compression, anchorage value for hooks 900 bend and 450 bend standards lapping of bars, check for development length. |
| 41 | | 1 | 4.3 Numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams (Explain through examples only) |
| 42 | | 1 | Revision |
| 43 | | 1 | Revision |
| 44 | | 1 | Practice on Problems |
| 45 | | 1 | Practice on Problems |
| 46 | 5 | 1 | 5.Analysis and Design of T-Beam (LSM) |
| 47 | | 1 | 5.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions. |
| 48 | | 1 | 5.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange. |
| 49 | | 1 | 5.3 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange shall be asked in written examination).. |
| 50 | | 1 | Revision |
| 51 | | 1 | Revision |
| 52 | | 1 | Practice on Problems |
| 53 | | 1 | Practice on Problems |

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| 54 | 6 | 1 | 6.Analysis and Design of Slab and Stair case (LSM) |
| 55 | | 1 | 6.1 Design of simply supported one-way slabs for flexure check for deflection control and shear. |
| 56 | | 1 | 6.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear. |
| 57 | | 1 | 6.3 Design of two-way simply supported slabs for flexure with corner free to lift. |
| 58 | | 1 | Revision |
| 59 | | 1 | Revision |
| 60 | | 1 | Practice on Problems |
| 61 | | 1 | Practice on Problems |
| 62 | | 1 | 6.4 Design of dog-legged staircase |
| 63 | | 1 | Practice on Problems |
| 64 | | 1 | 6.5 Detailing of reinforcement in stairs spanning longitudinally. |
| 65 | | 1 | Practice on Problems |
| 66 | 7 | 1 | 7 Design of Axially loaded columns and Footings (LSM) |
| 67 | | 1 | 7.1 Assumptions in limit state of collapse- compression. |
| 68 | | 1 | 7.2 Definition and classification of columns, effective length of column. |
| 69 | | 1 | Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties. |
| 70 | | 1 | 7.3 Analysis and design of axially loaded short square, rectangular and circular columns (with lateral ties only). |
| 71 | | 1 | Revision |
| 72 | | 1 | Practice on Problems |
| 73 | | 1 | 7.4 Types of footing, Design of isolated square column footing of uniform thickness for flexure and shear. |
| 74 | | 1 | Revision |
| 75 | | 1 | Practice on Problems |
| **Total** | | **75** | |

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