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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| --- | --- | --- | --- |
| **Course Code** | **20CE1001** | **Duration** | **3hrs** |
| **Course Title** | **BUILDING SCIENCE AND ENGINEERING** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Identify two geographical factors that influence climate. | | CO1 | U | 1 |
| 2. | Define macroclimate. | | CO1 | R | 1 |
| 3. | Name the three basic heat transfer mechanisms. | | CO2 | R | 1 |
| 4. | State one regulation related to thermal comfort in buildings. | | CO2 | R | 1 |
| 5. | Define energy-positive building. | | CO3 | R | 1 |
| 6. | List two natural energy gains used in buildings. | | CO3 | R | 1 |
| 7. | Describe reverberation. | | CO4 | U | 1 |
| 8. | State one quality indicator of room acoustics. | | CO4 | R | 1 |
| 9. | Define static daylighting metrics. | | CO5 | R | 1 |
| 10. | Explain why acoustics is important in auditorium design. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the difference between microclimate and macroclimate with examples. | | CO1 | U | 3 |
| 12. | Describe active and passive technologies used to achieve thermal comfort in buildings. | | CO2 | U | 3 |
| 13. | Explain the concept of energy-neutral buildings. | | CO3 | A | 3 |
| 14. | Identify two common acoustic materials used for sound absorption and describe their properties. | | CO4 | U | 3 |
| 15. | Explain the concept of visual quality in the built environment and its significance in daylighting design. | | CO5 | U | 3 |
| 16. | Explain the concept of thermal comfort in buildings. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Explain with examples how geographical and physical factors influence climate patterns. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. | a. | Compare active and passive thermal comfort technologies used in modern buildings. | CO2 | AN | 6 |
|  | b. | Apply the concept of thermal balance to explain how buildings maintain indoor temperature stability. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Illustrate the energy flow process in buildings with a labeled diagram. | CO3 | A | 6 |
|  | b. | Apply the principles of indoor comfort by identifying and explaining two key parameters that influence occupant well-being in energy-efficient buildings. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 20. | a. | Explain the role of sound absorption in building acoustics with a focus on material properties and their applications. | CO4 | U | 6 |
|  | b. | Apply the design principles of auditorium acoustics to control reverberation and improve sound clarity. | CO4 | A | 6 |
|  |  |  |  |  |  |
| 21. | a. | Interpret the relevance of LEED standards in daylighting design and energy efficiency. | CO5 | A | 8 |
|  | b. | Explain the role of the Integrated Design Approach (IDA) in sustainable building projects. | CO5 | A | 4 |
|  |  |  |  |  |  |
| 22. |  | Describe the importance of static daylighting metrics in evaluating building performance. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 23. | a. | Classify the types of energy gains in buildings with examples. | CO6 | U | 8 |
|  | b. | Identify three key indicators of energy use in buildings and describe their significance. | CO6 | U | 4 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Apply thermal comfort principles to design a sustainable residential building in a tropical climate. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| **CO1** | Identify the climate responsive design of buildings |
| **CO2** | Illustrate the thermal comfort and energy efficiency requirements |
| **CO3** | Illustrate acoustics, in the design of buildings |
| **CO4** | Demonstrate the principles of noise control |
| **CO5** | Design for visual quality and day lighting |
| **CO6** | Appraise the design principles in real time environment |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| --- | --- | --- | --- |
| **Course Code** | **20CE2004** | **Duration** | **3hrs** |
| **Course Title** | **SOIL MECHANICS AND FOUNDATION ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Identify the phases represented in a soil phase diagram. | | CO1 | U | 1 |
| 2. | List the different types of soil based on particle size. | | CO1 | R | 1 |
| 3. | Identify the concept of seepage pressure in soils. | | CO2 | U | 1 |
| 4. | Examine the effect of water flow on soil stability and structure. | | CO2 | R | 1 |
| 5. | Examine the purpose of the Proctor test. | | CO3 | R | 1 |
| 6. | Identify the compaction mechanism. | | CO3 | U | 1 |
| 7. | State the concept of stress distribution in soil media. | | CO4 | R | 1 |
| 8. | State Boussinesq's theory of stress distribution. | | CO4 | R | 1 |
| 9. | Identify the common equipment used for soil sampling in the field. | | CO5 | U | 1 |
| 10. | Name the types of shallow foundations. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Classify the different types of phase diagrams and their application in soil mechanics. | | CO1 | U | 3 |
| 12. | Explain Darcy's Law and its significance in soil mechanics. | | CO2 | An | 3 |
| 13. | Classify the components of Terzaghi’s one-dimensional consolidation theory formula. | | CO3 | An | 3 |
| 14. | Identify the key components of the Mohr–Coulomb failure theory. | | CO4 | U | 3 |
| 15. | Explain the methods of exploration used in soil investigation | | CO5 | U | 3 |
| 16. | Explain the concept of deep foundations and its types. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | A soil sample has a porosity of 40 percent. The specific gravity of solids is 2.70. Calculate (a) void ratio (b) dry density (c) unit weight of soil if 50% is saturated and (d) unit weight if the soil is completely saturated. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. |  | Explain the Constant Head and Falling Head permeability tests, including the relevant schematic diagrams. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Explain the principles and procedure involved in the Standard Proctor Compaction Test. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Calculate the intensity of vertical pressure and horizontal shear stress at a point  4m directly below a 20KN point load acting at a horizontal ground surface. What will be vertical pressure and shear stress at appoint 2m horizontally away from the axis of loading but at the same depth of 4m. | CO4 | An | 12 |
| 21. |  | Explain the exploration methods of auger and wash boring techniques, along with their differences, advantages, and applications. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. | a. | A layer of clay 5m thick lies under a newly constructed building. The effective pressure due to overlying strata on the clay layer is 3.0 Kg/cm2, and the new construction increase the overburden by 1.2kg/cm2. if the compression index of clay is 0.45, compute the settlement assuming the natural water content of the clay layer to be 43% and the specific gravity as 2.7 | CO3 | A | 6 |
| b. | Explain the two methods used to compute consolidation settlement. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 23. |  | Explain the methods of deep foundations and their applications in geotechnical engineering. | CO6 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | A strip footing 1m wide at its base is located at a depth of 0.8m below the ground surface, The properties of the foundation soil are unit weight is 18KN/m3, cohesion is 30KN/m2 and angle of internal friction is 20⁰.Calculate the safe bearing capacity using a factor of safety is 3. Use Terzaghi’s analysis. Assume that the soil fails by local shear | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | List the basic equations of elasticity |
| **CO2** | Distinguish between the applications of different types of finite elements. |
| **CO3** | Develop the finite element discrimination for seepage, consolidation soil structure interaction problems. |
| **CO4** | Identify the suitable foundation for construction |
| **CO5** | Design the foundation system for shallow depth |
| **CO6** | Analyse the earth retaining structures for different soil medium |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE2006** | **Duration** | **3hrs** |
| **Course Title** | **SOLID WASTE MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define landfill. | | CO4 | R | 1 |
| 2. | List any two methods of municipal solid waste collection. | | CO2 | R | 1 |
| 3. | Identify the types of solid waste based on physical composition. | | CO1 | U | 1 |
| 4. | List the material separation techniques. | | CO3 | R | 1 |
| 5. | Define solid waste. | | CO1 | R | 1 |
| 6. | List two advantages of composting. | | CO3 | R | 1 |
| 7. | Explain the impact of inefficient waste collection on public health. | | CO6 | U | 1 |
| 8. | Describe the advantages of incineration for energy recovery. | | CO3 | U | 1 |
| 9. | Define green waste. | | CO3 | R | 1 |
| 10. | State the role of solid waste management in industries. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Describe bathtub effect in landfill leachate management. | | CO4 | U | 3 |
| 12. | Define disposal methods. | | CO3 | R | 3 |
| 13. | Identify key factors affecting incineration efficiency. | | CO3 | U | 3 |
| 14. | Calculate per capita waste generation for a city of 1 million producing 650 tonnes/day. | | CO3 | A | 3 |
| 15. | Determine biogas plant advantages and limitations. | | CO6 | A | 3 |
| 16. | Summarize the need for transfer operations. | | CO2 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Summarize key features of the solid waste management rules, 2006. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Sketch a basic label design for solid waste identification. | CO5 | A | 6 |
|  | b. | Determine the impact of waste exchange on resource recovery. | CO6 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Evaluate properties of solid waste with examples. | CO1 | E | 12 |
|  |  |  |  |  |  |
| 20. |  | Evaluate biomedical waste disposal methods and segregation techniques for effective waste management. | CO3 | E | 12 |
|  |  |  |  |  |  |
| 21. |  | Evaluate incineration as a waste management technique, including a labeled diagram illustrating the process. | CO5 | E | 12 |
|  |  |  |  |  |  |
| 22. |  | Justify the selection of area, slope, trench, depression, or ramp methods for landfill based on site conditions. | CO4 | E | 12 |
|  |  |  |  |  |  |
| 23. |  | Classify the waste-to-energy technologies promoted under the Swachh Bharat Mission. | CO3 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Sketch different types of biogas systems with a labeled diagram. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| **CO1** | Analyse the nature and characteristics of municipal solid wastes. |
| **CO2** | Sort out the functional elements for solid waste management. |
| **CO3** | Apply the techniques and methods used in transformation, conservation and recovery of materials from solid waste. |
| **CO4** | Identify and design waste containment systems. |
| **CO5** | Gain knowledge in regulatory requirements regarding municipal solid waste management. |
| **CO6** | Apply the basic scientific principles for solving practical waste management challenges. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE2007** | **Duration** | **3hrs** |
| **Course Title** | **TRANSPORTATION ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Describe pragmatism. | | CO1 | U | 1 |
| 2. | Define other district roads (ODR). | | CO1 | R | 1 |
| 3. | State the formula for simple random sampling variance. | | CO2 | R | 1 |
| 4. | Interpret the objective of travel demand modeling. | | CO2 | U | 1 |
| 5. | Define the radius of relative stiffness of rigid pavement. | | CO3 | R | 1 |
| 6. | Describe the significance of the California Bearing Ratio (CBR) in pavement design. | | CO3 | R | 1 |
| 7. | State the carriage width for single-lane and two-lane classes of roads. | | CO4 | U | 1 |
| 8. | Define a horizontal curve. | | CO4 | R | 1 |
| 9. | Describe crossings in railway tracks. | | CO5 | U | 1 |
| 10. | Explain flag stations. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Describe any three key recommendation of the Nagpur Road Congress (1943). | | CO1 | U | 3 |
| 12. | List the general properties of any traffic flow model. | | CO2 | R | 3 |
| 13. | Distinguish three main types of critical distresses found in flexible pavement. | | CO3 | U | 3 |
| 14. | Explain any three objectives of providing a camber. | | CO4 | U | 3 |
| 15. | List the factors contributing to creep due to maintenance. | | CO5 | R | 3 |
| 16. | Explain telescopic method of track laying. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain the objectives and key phases of the Bharat Mala project. | CO1 | U | 8 |
|  | b. | Describe the major projects and their objectives under the National Rail Plan Vision 2024. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. | a. | Sketch the key elements of intersections and explain them in detail. | CO2 | A | 6 |
|  | b. | Give examples of any four types of intersections. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Explain the design of joints in rigid pavement. | CO3 | U | 6 |
|  | b. | Describe the design length and spacing of dowel bars with a neat diagram. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Write the analysis of overtaking sight distance on a two-lane road with two-way traffic and derive a formula where speed is in km/h. | CO4 | A | 8 |
|  | b. | Explain super elevation (e) with a neat diagram. | CO4 | U | 4 |
|  |  |  |  |  |  |
| 21. | a. | Illustrate a turnout with a neat diagram and explain its key components briefly. | CO5 | A | 8 |
|  | b. | List any four remedies to prevent creep. | CO5 | R | 4 |
|  |  |  |  |  |  |
| 22. | a. | Explain the length of the summit and valley curves, mentioning one case of consideration. | CO4 | U | 8 |
|  | b. | Distinguish between different types of gradients for roads and explain any three. | CO4 | A | 4 |
|  |  |  |  |  |  |
| 23. | a. | Illustrate the cross-section elements of the railway track. | CO5 | A | 6 |
|  | b. | Classify types of gradients recommended for railway tracks | CO5 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the different types of track drainage. | CO6 | U | 8 |
|  | b. | Describe the key features of tunnels. | CO6 | U | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Understand the concepts of development of highway and railway engineering |
| **CO2** | Explain the components of highway and railway engineering |
| **CO3** | Carryout the engineering surveys involved in planning of highway and railway engineering |
| **CO4** | Design the geometric elements of highway and railway engineering |
| **CO5** | Recognize the functions of structural elements of highway and railway engineering |
| **CO6** | Identify the materials used for the construction of highway and railway engineering |



**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE2011** | **Duration** | **3hrs** |
| **Course Title** | **ANALYSIS OF STRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define strain energy. | | CO1 | R | 1 |
| 2. | State the principle of virtual work. | | CO1 | R | 1 |
| 3. | Identify the assumptions made in the slope deflection method. | | CO2 | U | 1 |
| 4. | State the number of slope deflection equations required for a two-span continuous beam. | | CO2 | R | 1 |
| 5. | Find FEM for the member AB (MFAB) of the continuous beam shown in fig. | | CO3 | A | 1 |
| 6. | Draw the ILD for reaction at the left and right support of a simply supported beam. | | CO3 | A | 1 |
| 7. | List any two reasons for sway in a portal frame. | | CO4 | R | 1 |
| 8. | Recall the basic types of arches used in structural engineering. | | CO4 | R | 1 |
| 9. | Write an example of a statically determinate arch. | | CO5 | A | 1 |
| 10. | List any two primary forces acting on a cable subjected to uniformly distributed loads | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Compare strain energy and complementary energy. | | CO1 | U | 3 |
| 12. | For a two-span continuous beam, write the slope deflection equations assuming end rotations are unknown. | | CO2 | U | 3 |
| 13. | Illustrate the steps involved in analyzing a two-span continuous beam using the moment distribution method. | | CO3 | A | 3 |
| 14. | Explain the difference between influence line diagrams for a simply supported beam and a cantilever beam. | | CO4 | U | 3 |
| 15. | Explain the main functions of stiffening girders in suspension bridges. | | CO5 | U | 3 |
| 16. | Compare the application of the stiffness method in determinate and indeterminate trusses. | | CO5 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Determine the vertical deflection of point ‘C’ in the frame shown in fig. Given E = 200 kN/mm2 and I = 30 x 106 mm4. For span AB (I = 2I) and for span BC (I = I) | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Solve the continuous beam loaded as shown in figure by slope deflection method. also sketch the bending moment diagram. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | Solve the portal frame loaded as shown in fig. by moment distribution method also sketch bending moment diagram. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | A simply supported beam has a span of 16 m is subjected to a UDL of 13kN/m (longer than the span) traveling from left to right. Draw the ILD for shear force and bending moment at a section 4 m from the left end. Use these diagrams to determine the maximum shear force and bending moment at this section. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | A three hinged circular arch of span 16m and rise 4m is subjected to two point loads of 100 kN and 80 kN at the left and right quarter span points respectively. Find the reaction at the supports and bending moment, radial shear, normal thrust at 6m from left support. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | A suspension cable is supported at two points 25m apart. The left support is 2.5 m above the right support. The cable is loaded with a uniformly distributed load of 10 kN/m throughout the span. The maximum dip in the cable from the left support is 4m. Find the maximum and minimum tensions in the cable. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Solve the portal frame shown in fig. and draw the bending moment diagram using slope deflection method. Assume EI is constant. | CO3 | An | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Solve the continuous beam shown in fig. and draw the bending moment diagram using Stiffness martix method. Assume EI is constant | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Illustrate the concepts and principles. |
| **CO2** | Explain the behaviour of structural elements. |
| **CO3** | Analyze the structural members for various forces. |
| **CO4** | Analyze the response of the Structural elements. |
| **CO5** | Develop suitable response intricacies. |
| **CO6** | Adapt suitable analysis procedure. |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE2015** | **Duration** | **3hrs** |
| **Course Title** | **QUANTITY SURVEYING AND ESTIMATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | List any two types of estimates prepared for building construction. | | CO2 | R | 1 |
| 2. | Infer any two needs of estimation in building construction. | | CO2 | U | 1 |
| 3. | State the factors that affect material cost in building construction. | | CO2 | R | 1 |
| 4. | Write the formula to find the bar length in stirrups. | | CO3 | A | 1 |
| 5. | Define standard specifications in preparing the bill of quantity. | | CO3 | R | 1 |
| 6. | State valuation in building estimation. | | CO4 | R | 1 |
| 7. | Infer the factor which governs the mechanical systems in the building. | | CO6 | U | 1 |
| 8. | List any two factors that affect the building rent fixation. | | CO5 | R | 1 |
| 9. | Infer sinking fund method of depreciation in building estimation. | | CO5 | U | 1 |
| 10. | State any two factors affecting the preparation of the water supply scheme in the building. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Estimate the cost involved for 2.3 m3 of M20 concrete production, the cost of cement: sand: aggregate = 9Rs: 1.5Rs: 3Rs. Assume if any data is required. | | CO3 | An | 3 |
| 12. | Calculate the cost involved for the construction of a concrete beam of size 1.5m (Length) with a cross-section of 0.15m x 0.15m. Take the cost of cement: sand: aggregate = 10Rs: 2.5Rs: 3Rs. Assume if any data is required. | | CO3 | A | 3 |
| 13. | Estimate the cost involved for the construction of 2.5 cubic meters of masonry structure. Consider the brick size as 20cm x 10cm x 10cm. Take the cost of cement: sand: brick = 5Rs: 3Rs: 10Rs. Assume if any data is required. | | CO4 | An | 3 |
| 14. | Prepare a cost estimation report for a plain cement concrete beam of size 1.5m length, 0.15m width, and 0.15m depth. Consider the cost of cement: sand: aggregate = 5Rs: 2Rs: 3Rs. Use M20 grade concrete. Assume if any data is required. | | CO4 | A | 3 |
| 15. | Explain any two methods of depreciation in building valuation. | | CO5 | U | 3 |
| 16. | Illustrate the application of principles for the preparation of water supply schemes in residential buildings. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Differentiate the principles followed while selecting units of measurement and methods for measurement in building cost estimation. | CO1 | U | 6 |
|  | b. | Describe detailed specifications in building construction with suitable examples. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. |  | Explain general items of work for building cost estimation. | CO1 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Calculate the cost involved for the construction of a reinforced concrete deep beam having a size of 10m (Length), 0.5m (width), and 3m (depth). The beam has 2 numbers of 12mm diameter bar at the compression face and 5 numbers of 20mm diameter bar at the tension face. 10mm diameter stirrups were placed 0.2m center to center.  Consider the following data:   1. The cover to the reinforcement is 20mm. 2. Concrete grade M20 and Fe415 steel. 3. Cost of cement: sand: aggregate: steel = 5Rs: 2.5Rs: 3Rs: 65Rs.   Assume if any data is required. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Estimate the cost of the reinforced concrete column having a cross-sectional size of 0.5m x 0.5m, the overall height of the column was 6m. The column has 4 numbers of 20mm diameter bars, with 10mm diameter ties placed 0.2m center to center. Use the following data:   1. Use M25 grade concrete and Fe 415 steel. 2. Column has a 25mm cover. 3. Cost of cement: sand: aggregate: steel = 8Rs: 2Rs: 3.5Rs: 72Rs.   Assume if any data is required. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Calculate the cost of production of reinforced concrete slab of size 12m (length), 6m (width), and 0.15m (depth). The concrete used for the construction of the slab was M20, with a steel grade of Fe550. The slab has a 12mm diameter bar spaced 120mm center to center in both directions.  Consider the following data:   1. The cover to the reinforcement is 20mm. 2. Concrete grade M20 and Fe550 steel. 3. Cost of cement: sand: aggregate: steel = 10Rs: 2.5Rs: 3Rs: 60Rs.   Assume if any data is required. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Estimate the cost required for the construction of a masonry wall, having a size of 4.5m (Length), 0.23m (Breadth), and 3m (Height). Use mortar thickness of 1:5 and brick size of 20cm x 10cm x 10cm. Take the cost of cement: sand: brick = 6Rs: 2.5Rs: 10Rs. Assume if any data is required. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 23. |  | Calculate the cost involved for the construction of the septic tank, the tank has two compartments of size 2m x 2m each, and the overall depth of the tank was 3m from the ground level. Compartment one has an inspection vent of 0.23m and compartment two has a hole cleaning vent of diameter 0.6m. The thickness of the septic tank masonry wall was 0.23m.  Consider the following data:   1. Use the mortar ratio of 1:4 2. Cost of cement: sand: brick= 9Rs: 2Rs: 12Rs. 3. The cost of a 6m length 230mm diameter pipe was 500Rs.   Assume if any data is required. | CO2 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Prepare a detailed report on estimates for the construction of a residential building for an Assistant professor in Karunya Nagar. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | List the detailed specification for different types of structures |
| **CO2** | Plan the rate analysis of civil engineering works |
| **CO3** | Determine the rates of various items of civil works |
| **CO4** | Justify estimated cost of civil construction projects |
| **CO5** | Evaluate the actual value of any property |
| **CO6** | Explain specifications and tendering process for contracts |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE2018** | **Duration** | **3hrs** |
| **Course Title** | **CONSTRUCTION ENGINEERING AND MANAGEMENT** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | State the need for site clearance in building construction. | | CO1 | R | 1 |
| 2. | List any two types of shoring used in unsafe structures. | | CO1 | R | 1 |
| 3. | Define ground freezing in soil stabilization. | | CO2 | R | 1 |
| 4. | Name any two types of masonry construction. | | CO2 | R | 1 |
| 5. | Infer tunnel shaft in underground construction. | | CO3 | U | 1 |
| 6. | State any two examples of sole proprietorshipin business. | | CO4 | R | 1 |
| 7. | Infer site mobilization in a construction site. | | CO4 | U | 1 |
| 8. | State any two steps in resource allocation process for building construction. | | CO4 | R | 1 |
| 9. | Define cost slope in project management. | | CO5 | R | 1 |
| 10. | Infer network analysis in project management. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Describe any three methods of soil excavation. | | CO1 | U | 3 |
| 12. | Explain pre-stressed concrete with its concepts and needs. | | CO2 | U | 3 |
| 13. | Illustrate the common effects associated with ground movement during building construction. | | CO3 | U | 3 |
| 14. | Compare shallow and deep shafts in underground construction. | | CO2 | U | 3 |
| 15. | Describe the types of precast systems used in building construction. | | CO4 | U | 3 |
| 16. | Illustrate material wastage analysis in high-rise building construction. | | CO5 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain the factors that should be considered while selecting site for any residential building. | CO1 | U | 6 |
|  | b. | Classify the foundation types based on soil condition. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 18. |  | Describe the sequence of work for constructing an office building in Dubai. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 19. |  | Compare framed and non-framed building construction in detail with suitable examples. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Summarize the merits and demerits of a pre-engineered building over conventional building. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Illustrate the methods of construction adopted in underwater wind turbine foundations with a suitable sketch. | CO3 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain the concepts and needs of management in construction. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Differentiate site mobilization and demobilization with its significance, and challenges in detail. | CO5 | U | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain the roles and functions of construction project managers. | CO6 | U | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| **CO1** | Recall the basics of building components |
| **CO2** | Understand the items / facets of construction engineering |
| **CO3** | Apply the construction engineering techniques for various components |
| **CO4** | Demonstrate construction project management skills and apply tools of project management |
| **CO5** | Explain the importance of project management |
| **CO6** | Propose an Engineering and Management Plan |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE2019** | **Duration** | **3hrs** |
| **Course Title** | **DESIGN OF PRECAST CONCRETE STRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define precast concrete in modern construction. | | CO1 | R | 1 |
| 2. | List two advantages of using prefabricated systems in construction. | | CO1 | R | 1 |
| 3. | List two common types of precast roof and floor systems. | | CO2 | R | 1 |
| 4. | Mention one type of bearing used for supporting precast units. | | CO2 | R | 1 |
| 5. | List any two types of precast slabs used in construction. | | CO3 | R | 1 |
| 6. | Describe the difference between hollow-core and solid precast slabs. | | CO3 | U | 1 |
| 7. | List any two types of structural joints. | | CO4 | R | 1 |
| 8. | Identify two common materials used in structural connections. | | CO4 | U | 1 |
| 9. | State one method to prevent progressive collapse in buildings. | | CO5 | R | 1 |
| 10. | Name one high-performance material used in modern precast elements. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the importance of smart lifting systems in the erection phase of precast structures. | | CO1 | U | 3 |
| 12. | Analyze the role of facade elements in precast buildings and their impact on aesthetics and functionality. | | CO2 | An | 3 |
| 13. | Explain the role of load distribution and load factors in the design of precast structures. | | CO3 | U | 3 |
| 14. | List any four types of joints used in structural connections. | | CO4 | R | 3 |
| 15. | Describe the basic principles of pre-stressed precast concrete and its advantages in structural applications. | | CO5 | R | 3 |
| 16. | Explain the role of Building Information Modeling (BIM) in improving coordination during precast construction. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Describe the complete process of precast concrete production, from material selection to the final erection of elements on-site. | CO1 | U | 8 |
|  | b. | Explain the steps involved in the transportation, erection, and quality control of precast elements, including the use of smart lifting systems. | CO1 | U | 4 |
|  |  |  |  |  |  |
| 18. | a. | Examine the key design requirements of precast concrete structures, considering aspects such as structural integrity and durability with relevant codes and standards. | CO2 | A | 8 |
|  | b. | Describe the role of bearing in precast units and its importance in load transfer. | CO2 | U | 4 |
|  |  |  |  |  |  |
| 19. |  | Evaluate the design of a simply supported precast prestressed concrete beam for a warehouse structure with the following specifications: Span: 8 m  Beam Cross-section: Rectangular (300 mm × 600 mm)  Self-weight: 7 kN/m  Superimposed Dead Load (SDL): 5 kN/m  Live Load (LL): 15 kN/m  Concrete Strength (f'c): 40 MPa  Prestressing Steel Strength (fpu): 1860 MPa  Loss of Prestress: 20% | CO3 | E | 12 |
|  |  |  |  |  |  |
| 20. |  | **Explain** the different types of structural joints with neat sketches and their applications. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Analyze the role of pre-tensioning and post-tensioning in enhancing the durability and strength of concrete structures. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. | a. | Explain the advantages and challenges of using prefabricated systems in large-scale construction projects. | CO1 | U | 8 |
|  | b. | **Evaluate** the merits and limitations of incorporating off-site manufactured precast modules into extensive development projects. | CO1 | E | 4 |
|  |  |  |  |  |  |
| 23. |  | **Analyze** how improper selection of joint fillers can lead to long-term structural issues. | CO4 | An | 12 |
|  |  |  |  |  |  |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | **Analyze** a real-world case study of a successful precast construction project. Discuss the advantages and challenges faced during its execution. | CO6 | An | 12 |
|  |  |  |  |  |  |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Identify the suitable prefabrication building system |
| **CO2** | Explain the behavior of precast elements |
| **CO3** | Classify different types of joints for prefabricated structures |
| **CO4** | Analyse the building system and joints |
| **CO5** | Design the components of precast building system |
| **CO6** | Appraise the possibilities of progressive collapse |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE2037** | **Duration** | **3hrs** |
| **Course Title** | **NOISE POLLUTION AND ITS CONTROL** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Differentiate between noise and sound. | | CO1 | U | 1 |
| 2. | List the four types of noise. | | CO1 | R | 1 |
| 3. | State the meaning of offensive noise. | | CO1 | U | 1 |
| 4. | List any two physiological impacts of noise pollution. | | CO3 | R | 1 |
| 5. | State the year of enactment for the motor vehicles act. | | CO3 | U | 1 |
| 6. | Define noise pollution. | | CO1 | R | 1 |
| 7. | Describe the purpose of a noise rating system. | | CO3 | U | 1 |
| 8. | Explain the primary objective of The Noise Pollution (Regulation and Control) Rules, 2000. | | CO6 | U | 1 |
| 9. | State the full form of NIOSH. | | CO6 | R | 1 |
| 10. | Identify two factors influencing annoyance due to noise pollution. | | CO2 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain the importance of noise rating in environmental assessment. | | CO3 | U | 3 |
| 12. | Compare auditory and non-auditory effects of noise pollution. | | CO3 | An | 3 |
| 13. | Identify major applications of strategic noise mapping in India. | | CO6 | U | 3 |
| 14. | Evaluate the role of vegetation and green spaces in noise mitigation. | | CO5 | E | 3 |
| 15. | Evaluate the necessity of implementing real-time noise monitoring systems in India. | | CO6 | E | 3 |
| 16. | Explain the role of public awareness and education in noise control. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Explain the limitations and further considerations in transportation noise management. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 18. | a. | Evaluate the effectiveness of strategic noise mapping in Asian countries and the European Union. | CO4 | An | 6 |
|  | b. | Calculate the equivalent average noise level (Leq) for a source emitting 80 dB, 60 dB, and 100 dB at different times of the day. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. |  | Explain the following in urban noise management  1.Noise assessment,  2.L10, L50, & L90. | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. |  | Justify the limitations of sound-absorbent materials and anti-noise devices in environmental noise reduction. | CO5 | E | 12 |
|  |  |  |  |  |  |
| 21. |  | Evaluate the environmental noise directive (END) with its objectives, key components, mitigation strategies, and challenges. | CO6 | E | 12 |
|  |  |  |  |  |  |
| 22. |  | Evaluate the effectiveness of strategic noise mitigation approaches, including source-based abatement and propagation measures. | CO4 | E | 12 |
|  |  |  |  |  |  |
| 23. |  | Compare road traffic noise, railway noise, and aircraft noise in terms of sources and mitigation. | CO3 | E | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Evaluate strategic noise mapping with a labeled diagram illustrating its process and significance. | CO4 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Identify the nature and characteristics of noise pollution |
| **CO2** | Analyze the noise pollution problems |
| **CO3** | Detect the various effects of noise pollution |
| **CO4** | Apply suitable preventive measures and identify the technologies and methods to control of noise |
| **CO5** | Choose suitable noise adsorbent materials |
| **CO6** | Gain knowledge about the various noise pollution regulations |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE2047** | **Duration** | **3hrs** |
| **Course Title** | **INTELLIGENT TRANSPORTATION SYSTEMS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Cite any one of the benefits of intelligent transportation systems. | | CO1 | U | 1 |
| 2. | Mention any one objective of intelligent transportation systems. | | CO1 | R | 1 |
| 3. | Write any one role of telecommunications in intelligent transportation systems. | | CO2 | R | 1 |
| 4. | Define wireless type of telecommunication. | | CO2 | R | 1 |
| 5. | Cite any one of the key functions of advanced traveller information systems. | | CO3 | U | 1 |
| 6. | Describe dynamic message signs. | | CO3 | R | 1 |
| 7. | Describe incident management systems. | | CO4 | U | 1 |
| 8. | List any one of the objectives of travel and traffic management. | | CO4 | R | 1 |
| 9. | Describe V2V type communication. | | CO5 | U | 1 |
| 10. | Summarize electronic toll collection. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain about infrared detectors. | | CO1 | An | 3 |
| 12. | Describe data collection process in information management systems. | | CO2 | U | 3 |
| 13. | Explain vehicle-to-infrastructure type communication. | | CO3 | An | 3 |
| 14. | Explain advanced traveler information systems. | | CO4 | U | 3 |
| 15. | Explain adaptive cruise control. | | CO5 | An | 3 |
| 16. | Describe automatic breaking and steering systems. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Examine the effectiveness of video data collection in various transportation applications. | CO1 | An | 12 |
|  |  |  |  |  |  |
| 18. |  | Explain commercial vehicle operations and various technologies used in it. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Analyze the role of a traffic management center in urban mobility, focusing on its functions and components. | CO2 | An | 12 |
|  |  |  |  |  |  |
| 20. |  | Explain electronic payment systems and its types. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 21. |  | Summarize various advanced vehicle safety systems. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Explain automatic highway systems and its components. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Develop a strategy for effective public transportation management in urban areas. | CO4 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Explain a case study on the implementation of intelligent transportation systems in a developed country, highlighting the key technologies used and their impact on traffic management. | CO6 | An | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| **CO1** | Understand the concept of ITS, with particular emphasis on advanced traffic management and traveler |
| **CO2** | Information issues explain the human factor issues for ITS generalize the sensor and communication technologies |
| **CO3** | Apply the various ITS methodologies |
| **CO4** | Define the significance of its under Indian conditions |
| **CO5** | Describe the elements of Vehicle Location, Route Navigation and Guidance concepts |
| **CO6** | Define the significance of ITS under International conditions |



**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE3004** | **Duration** | **3hrs** |
| **Course Name** | **FINITE ELEMENT METHODS IN CIVIL ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. |  | Determine the deflection at midspan of a simply supported beam carrying a concentrated load W at the center using the Rayleigh-Ritz method and compare the result with the exact solution. | CO1 | A | 16 |
|  |  |  |  |  |  |
| 2. |  | Evaluate the cartesian co-ordinates of point P which has local coordinates ξ = 0.6 and η = 0.8 as shown in figure. | CO2 | E | 16 |
|  |  |  |  |  |  |
| 3. |  | Develop element stiffness matrix for the contuous beam shown in fig. Take E = 200 GN/m2, I= 4 x 10-6 m4 and A = 4 x 10-3 m2 | CO3 | A | 16 |
|  |  |  |  |  |  |
| 4. | a. | Develop the shape function for ZIB 8 elements and its significance in finite element analysis. | CO2 | A | 13 |
|  | b. | Differentiate between constant strain triangle and linear strain triangle in terms of formulation and application. | CO3 | U | 3 |
|  |  |  |  |  |  |
| 5. |  | Formulate the stiffness matrix for a Mindlin-Reissner plate element with 12 degrees of freedom. | CO5 | U | 16 |
|  |  |  |  |  |  |
| 6. |  | For the two bar truss shown in fig. Determine the displacement of node 1 and stress in element 1-3. Take E = 70 x 103 N/mm2 and A = 200 mm2  C:\Users\Admin\Downloads\processed_structural_diagram.png | CO4 | A | 16 |
|  |  |  |  |  |  |
| 7. | a. | Demonstrate the differences between flat, curved, solid, and degenerated shell elements in structural analysis. | CO4 | A | 8 |
|  | b. | Describe the characteristics of conforming and non-conforming rectangular plate bending analysis. | CO3 | U | 8 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. | a. | Illustrate mesh generation techniques to develop structured, unstructured, and hybrid meshes. | CO6 | U | 10 |
|  | b. | Demonstrate the application of H, P, and R methods in mesh refinement for Finite Element Analysis | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the principles for the development of finite element models |
| CO2 | Develop shape function, strain displacement relation, stiffness matrix and consistent load vector matrix |
| CO3 | Explain the finite element procedure for structural element |
| CO4 | Analyze one, two and three dimensional problems |
| CO5 | Choose appropriate finite element for analysis depending on the nature of problem |
| CO6 | Develop finite element models using suitable software |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE3006** | **Duration** | **3hrs** |
| **Course Title** | **DESIGN OF SUBSTRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Calculate the ultimate bearing capacity (qu​) of a shallow foundation in cohesive soil using Terzaghi’s or Meyerhof’s bearing capacity equations, considering soil properties and foundation dimensions. | CO1 | A | 10 |
|  | b. | **Evaluate** the impact of the water table on foundation bearing capacity and settlement behavior of footings and rafts, and analyze how field test data can be utilized to design the foundation. | CO1 | E | 6 |
|  |  |  |  |  |  |
| 2. |  | Analyze the design requirements for a suitable pile cap for a 550 mm × 550 mm column carrying a factored load of 2600 kN, supported on four piles of 450 mm diameter, spaced at 1350 mm centers. Consider M25 grade concrete (fck = 25 N/mm²) and Fe415 steel (fy = 415 N/mm²) while ensuring adequate load distribution, structural stability, and reinforcement detailing. | CO2 | An | 16 |
|  |  |  |  |  |  |
| 3. |  | Explain the key IS and IRC code provisions related to the design consideration of well foundations, including their significance in ensuring structural safety. | CO3 | U | 16 |
|  |  |  |  |  |  |
| 4. |  | Determine the lateral pressure and check for sliding of an ordinary cantilever retaining wall with level backfill to retain 4 m of earth and the soil's internal friction angle is 30° of unit weight 19 kN/m2. | CO4 | A | 16 |
|  |  |  |  |  |  |
| 5. | a. | **Discuss** the different types of machine foundations and their specific applications, highlighting how each type is designed to handle machine-induced vibrations. | CO5 | U | 8 |
|  | b. | **Compare** various vibration isolation techniques in machine foundation design and justify the selection of suitable isolation strategies for different machine applications. | CO5 | An | 8 |
|  |  |  |  |  |  |
| 6. | a. | **Evaluate** how underground investigations contribute to the development of structural support systems by detailing initial assessments, borehole studies, soil extraction, and field examinations on ground conditions. | CO1 | E | 8 |
|  | b. | Determine the maximum load a building's footing can support on clay soil terrain by applying geotechnical formulas and incorporating both the soil's mechanical characteristics and the footing's size. | CO1 | A | 8 |
|  |  |  |  |  |  |
| 7. | a. | Evaluate the ultimate bearing capacity of a single pile under axial load, considering different soil conditions. | CO2 | E | 10 |
|  | b. | **Describe** negative skin friction, outlining its basic causes and the resulting impact on foundation performance. | CO2 | U | 6 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. |  | **Evaluate** the performance of different temporary dam structure under varying hydrostatic pressures, considering factors such as seepage control and structural stability. | CO6 | E | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

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|  | **COURSE OUTCOMES** |
| CO1 | Identify the methods of subsoil exploration |
| CO2 | Evaluate the soil shear strength parameters. |
| CO3 | Determine the load carrying capacity of different foundation types. |
| CO4 | Analyze the concepts of settlement analysis. |
| CO5 | Select appropriate foundations type based on available soil conditions. |
| CO6 | Design suitable foundations based on the soil conditions |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20CE3015** | **Duration** | **3hrs** |
| **Course Title** | **BRIDGE ENGINEERING** | **Max. Marks** | **100** |

**(IRC Code books, Bridge Rule, IS 456-200, 1S1343-2012 and IS 800-2007 are permitted)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** |  | **Questions** | **CO** | **B** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Compare Class AA tracked vehicle and wheeled vehicle with 70 R loading. | CO1 | U | 4 |
| b. | Design the longitudinal girder for a RCC Tee beam bridge for the following data:    Clear width of roadway - 7.5m  Wearing coat - 75mm  No. of main girders - 3  Span (c/c of bearing) - 15m  Spacing of cross girder - 5m c/c  Loading - IRC Class AA tracked vehicle  M20 grade of concrete, Fe 415 grade steel is use | CO4 | A | 12 |
|  | | | | | |
| 2. | a. | How would you determine the moments and shear forces in the design of a deckslab using Pigeaud’s Charts. | CO3 | A | 4 |
| b. | Design a post- tensioned prestressed concrete slab bridge for a national highway crossing to suit the following data:  Width of carriage way = 7.5m  Foot path = 1m on either side  Kerbs = 600mm wide  Clear Span = 8 m  Type of loading = IRC Class AA or Class A whichever gives the worst effect  Materials – M40 grade concrete and 7mm diameter high tensile wires with an ultimate tensile strength of 1500 N/mm2 housed in cables with 12 wires and anchored by Freyssinet anchorages of 150mm diameter. Compressive strength at transfer, fci = 35 N/mm2. Loss ratio = 0.8. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 3. | a. | Specify the situation, when the losses due to elastic shortening can be ignored in Prestressed concrete bridges. | CO2 | U | 4 |
|  | b. | Design a suitable section for the longitudinal girder of a post tensioned prestressed concrete T Beam Bridge for a National Highway crossing to suit the following data:  Effective span - 15m  Equivalent Live load - 20kN/m  Adopt M45 grade of concrete with cube strength at transfer as 40 N/mm2 and 7mm HTS wires initially stretched to 1200MPa. Loss ratio - 0.80 | CO4 | A | 12 |
|  |  | | | | |
| 4. | a. | Classify the different types of steel bridges according to span and utility. | CO1 | R | 4 |
| b. | The effective span of a through type truss girder highway through two lane bridge is 64m. The reinforced concrete slab is 250mm thick inclusive of wearing coat. The foot paths are provided on either side of the carriage way. The spacing between centre to centre of the truss girder is 13m. Suggest a suitable truss girder for the bridge. Design the central top chord member. The highway bridge is to carry IRC Class A standard loading. | CO3 | An | 12 |
|  |  |  |  |  |  |
| 5. | a. | When would you select trussed girder instead of Plate Girder Bridges? | CO2 | U | 4 |
| b. | The effective span of a through type plate girder railway bridge is 30m. The stringers are spaced 2m between centerlines. 0.60 kN per meter stock rails and 0.40 kN per metre checkrails are provided. Sleepers are spaced at 0.45m from center to center and are of size 2.8 m x 250 mm 250 mm. The weight of timber may be assumed as 7.5 kN/m3. The spacing between main girders is 9.8m. Design the maximum bending moment and shear force for which the plate girder has to be designed, if the bridge is to carry standard main lane loading for broad gauge track.  EUDLL for mainline loading (30m span) = 2800 kN & IF = 0.455 | CO3 | An | 12 |
|  |  | | | | |
| 6. | a. | Classify the different types of pile foundations adopted in bridges | CO1 | U | 4 |
| b. | Verify the stability of the abutment shown in Fig. The other salient details are given below:   * 1. Materials of the abutment - concrete   2. Density of the soil - 18 kN/m3   3. Coefficient of friction - 0.5   4. Angle of repose of the soil ϕ = 30°   Live load on the bridge: IRC Class AA (tracked)  Span of the bridge = 12m  Angle of friction between the soil and concrete = δ = 18°  The bridge deck consists of three longitudinal girders 1.5m depth with a deck slab of 200mm thick. | CO5 | E | 12 |
|  |  | | | | |
| 7. | a. | State the different types of foundations adopted for bridges. | CO1 | R | 4 |
| b. | Design a well foundation for an abutment of 10m x 5m base dimensions as shown in Fig. The well is founded on a sandy soil. The data available are as follows:  **Height of bearing above maximum scour level : 28m**  Permissible horizontal displacement of the bearing level is 50mm  **Height of the abutment = 6.0m**  Total vertical load including weight of the abutment and well (considering  buoyancy effect) = 20,000kN  **Total lateral load at the scour level = 400kN**  Submerged unit weight of soil = 9.5 kN/m3 | CO4 | A | 12 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. |  | Evaluate the reasons for the failure of a major bridge with salient details. | CO6 | E | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Classify bridges according to loading and site conditions |
| CO2 | Explain the behaviour of different types of bridges |
| CO3 | Analyze different types of bridges |
| CO4 | Design the different components of bridges |
| CO5 | Appraise on the quality investigation of bridge structures |
| CO6 | Investigate the reasons for the failure of bridge structures |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| **Course Code** | **20CE3016** | **Duration** | **3hrs** |
| **Course Title** | **CONDITIONAL ASSESSMENT OF EXISTING STRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain the causes of building distress with suitable examples. | CO1 | U | 8 |
|  | b. | Illustrate the need for a detailed conditional assessment for an old building. | CO1 | A | 8 |
|  |  |  |  |  |  |
| 2. | a. | Describe the methodology for conducting rapid (visual) investigation of an old structure. | CO2 | U | 8 |
|  | b. | Summarize the stepwise approach for preliminary analysis of a deteriorated building. | CO2 | U | 8 |
|  |  |  |  |  |  |
| 3. | a. | Compare destructive and non-destructive testing techniques in structural assessment. | CO3 | U | 8 |
|  | b. | Articulate the effectiveness of rebound hammer and ultrasonic pulse velocity tests in evaluating Pamban bridge. | CO3 | A | 8 |
|  |  |  |  |  |  |
| 4. | a. | Select appropriate destructive and non-destructive testing methods for assessing a historical masonry structure. Justify your selection. | CO4 | U | 8 |
|  | b. | Describe the role of professional responsibility and liability in the structural assessment process. | CO4 | U | 8 |
|  |  |  |  |  |  |
| 5. | a. | Interpret the test results of non-destructive evaluation techniques and propose suitable rehabilitation measures. | CO5 | U | 8 |
|  | b. | Explain the strategy to diagnose structural deterioration based on test data and inspections. | CO5 | U | 8 |
|  |  |  |  |  |  |
| 6. | a. | Evaluate the significance of deterioration modeling and hazard identification in condition assessment of nuclear power plant. | CO6 | An | 8 |
|  | b. | Classify proactive strategies for maintaining the structural integrity of Taj Mahal. | CO6 | U | 8 |
|  |  |  |  |  |  |
| 7. | a. | Describe the inspection checklist for evaluating structural components of a parking structure. | CO6 | U | 8 |
|  | b. | Illustrate any four-retrofitting techniques for a deteriorated concrete bridge constructed in the year 1876. | CO6 | A | 8 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. |  | Summarize a detailed structural condition assessment report for a multi-story residential building, incorporating observations, test data, and rehabilitation recommendations. | CO1 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Understand the procedure for identifying the structure exposed to aggressive environment |
| CO2 | Apply the guidelines for structural condition assessment of existing buildings |
| CO3 | Identify techniques for evaluating concrete masonry and wood |
| CO4 | Select the destructive and non destructive techniques to suite the projects |
| CO5 | Interpret and use destructive and nondestructive test results |
| CO6 | Evaluate and report the conditional assessment of existing structure |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

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| --- | --- | --- | --- |
| **Course Code** | **21CE3004** | **Duration** | **3hrs** |
| **Course Title** | **ADVANCED DESIGN OF STEEL STRUCTURES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain about moment rotation behavior and different phases of its behavior. | CO1 | U | 8 |
|  | b. | Describe about ductility and factors affecting it. | CO2 | R | 8 |
|  |  |  |  |  |  |
| 2. |  | Design base plate and its connections for a column section ISHB 350 @ 661.2 N/m which carries a factored axial compressive load of 1750 kN and factored bending moment of 120 kNm. Assume concrete pedestal of M-25 grade. | CO3 | An | 16 |
|  |  |  |  |  |  |
| 3. |  | Design a bolted framed connection, when an ISLB 300 @ 369.8 N/m transmits an end reaction of 400kN, under factored loads to the web of ISMB 450 @ 710.2 N/m. Steel is of grade Fe 415 and bolts are of grade 4.5. | CO4 | An | 16 |
|  |  |  |  |  |  |
| 4. |  | Design a roof truss for a factory building for a span of 20 m and a pitch of 1/5. The height of the truss at eaves level is 10 m. The spacing of the trusses is 4.5 m. The factory building which is 36 m long, is situated at Delhi. Take fy = 250 N/mm2 for the steel sections. Provide Fink truss. | CO4 | An | 16 |
|  |  |  |  |  |  |
| 5. |  | Compute the lateral loads on various floor levels of a 7 storey steel structure by static analysis. The structure is located at Kolkata (Zone III). The type of soil encountered is medium stiff and it is proposed to design the building with special moment resisting frames. The intensity of dead load is 10 kN/m2 and the floors are to cater an imposed load of 3 kN/m2. There are 7 floors in total with a height of 3.5 m each. The structure is in a plot with dimensions 8 m × 8m. | CO5 | A | 16 |
|  |  |  |  |  |  |
| 6. |  | Plan a suitable configuration for a 60 m high microwave antenna lattice tower  which is to be built near Agra where the terrain at the site is nearly a level ground with terrain of category 2. The diameter of the hemi – spherical antenna disc, fixed at the top is 3 m. The width of the tower at the top has to be 3.5 m. Determine maximum compressive force and tension in the tower legs and also the maximum shear at the base, for the following data.   1. Weight of the antenna disc and fixtures: 9 kN 2. Weight of the platform at top: 0.82 kN/m2 3. Weight of railing at top: 0.30 kN/ m2 4. Weight of ladder and the cage: 0.65 kN/m 5. Weight of miscellaneous items: 2.5 kN | CO5 | An | 16 |
|  |  |  |  |  |  |
| 7. | a. | Explain the following terminologies:   1. Magnitude of Earthquake 2. Modal mass 3. Modal participation factor 4. Mode shape coefficient | CO2 | U | 8 |
|  | b. | Design a slab base for a column ISHB 350 @ 710N/m subjected to a factored axial compressive load of 1500 kN for the following conditions.   1. Load is transferred to the base plate by direct bearing of column flanges. 2. Load is transferred to the base plate by welded connections; the column end and the base plate are not machined for bearing.   The base rests on concrete pedestal of grade M20. | CO6 | An | 8 |
| **PART – B (1 X 20 = 20 MARKS) [Compulsory Question]** | | | | | |
| 8. | a. | Evaluate the safe load carrying capacity of two channels 200 mm × 80 mm with bent lips which are connected with webs to act as a column. The thickness of the plate is 2.5 mm and the depth of lips is 25 mm. Determine the safe load carrying capacity if the effective length of column is (a) 4 m and (b) 6 m. Take fy = 235 N/mm2 and E = 2 × 105 N/mm2. | CO6 | E | 17 |
|  | b. | Differentiate between cold formed and hot rolled steel sections. | CO5 | U | 3 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Identify the appropriate structural steel section |
| CO2 | Explain the behavior of different steel structural elements |
| CO3 | Perform the analysis of steel structures |
| CO4 | Design the components of steel structural elements and its connection |
| CO5 | Appraise on the quality parameters for steel structures |
| CO6 | Understand the reasons for failure of a steel structure |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **24CE1002** | **Duration** | **3hrs** |
| **Course Title** | **ENGINEERING MECHANICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Draw a free-body diagram for a particle in equilibrium under three non-collinear forces. | | CO1 | R | 1 |
| 2. | Define the concept of force resolution in the context of coplanar forces. | | CO1 | R | 1 |
| 3. | Explain the basic principle of the method of joints in truss analysis. | | CO2 | U | 1 |
| 4. | Determine the number of support reactions for a simply supported beam. | | CO2 | A | 1 |
| 5. | List two characteristics of dry friction. | | CO3 | U | 1 |
| 6. | Name one practical application of ladder friction. | | CO3 | R | 1 |
| 7. | Define centre of gravity and centroid. | | CO4 | R | 1 |
| 8. | Define the term moment of inertial. | | CO4 | R | 1 |
| 9. | Define **displacement** in motion. | | CO5 | R | 1 |
| 10. | Define the **work-energy theorem.** | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Discuss the basic laws and principles considered in the foundation of mechanics. | | CO1 | R | 3 |
| 12. | Explain different types of supports and their reactions. | | CO2 | U | 3 |
| 13. | Calculate the coefficient of friction if a block on a rough surface requires a 60 N force to initiate motion when it weighs 100 N. | | CO3 | A | 3 |
| 14. | Derive an expression for the centre of gravity of a plane area using method of moments | | CO4 | A | 3 |
| 15. | A car moves with a velocity of **20 m/s** and stops in **5 seconds** under uniform acceleration. Determine the acceleration. | | CO5 | A | 3 |
| 16. | A force of 20 N moves a body 5 m in the direction of the force. Calculate the work done. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. |  | Determine the forces in strings AC and BC that support a 15 N electric light fixture hanging from point C. Given that AC is inclined at 60° to the horizontal and BC at 45° to the vertical, use equilibrium conditions to solve for the tensions in both strings. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 18. |  | Determine the reactions and forces in the members of the truss(Fig.) of span 5 m loaded as shown below, | CO2 | An | 12 |
|  |  |  |  |  |  |
| 19. |  | Determine the frictional force acting at the point of contact between the ladder and floor, given that a uniform ladder of length 13 m and weight 25 N is placed against a smooth vertical wall with its lower end 5 m from the wall. The coefficient of friction between the ladder and the floor is 0.3. Show that the ladder will remain in equilibrium in this position. Use static equilibrium equations to find the required values. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 20. |  | Calculate the center of gravity of the given I-section. | CO4 | A | 12 |
|  |  |  |  |  |  |
| 21. |  | Analyze the motion of two particles—one dropped from a 90 m tower and the other projected upwards from the base. Find the velocity with which the second particle was projected upwards, given that they meet at 30 m height. | CO5 | An | 12 |
|  |  |  |  |  |  |
| 22. | a. | Determine the reactions RA ​ and RC at the points of contact for a ball weighing 120 N resting in a right-angle groove. The sides of the groove are inclined at 30° and 60° to the horizontal. Assume all surfaces are smooth and use equilibrium conditions to solve for the reactions. | CO1 | A | 8 |
|  | b. | Determine the resultant force in magnitude and direction for two forces acting at a point O, as shown in the figure. | CO1 | A | 4 |
|  |  |  |  |  |  |
| 23. |  | Evaluate the moment of inertia of the shaded area shown in the figure about edge AB. | CO4 | E | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Compute (a) the maximum distance travelled by a 20 N body projected up a 20° inclined plane with an initial velocity of 12 m/s, considering a coefficient of friction of 0.15, and (b) the velocity of the body when it returns to its original position. | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Illustrate the concepts of mechanics |
| **CO2** | Identify the principles of dynamics |
| **CO3** | Examine the concepts of kinetics |
| **CO4** | Analyse the stresses in the members |
| **CO5** | Apply the equilibrium concepts in analysis of members |
| **CO6** | Define the basic principles to solve problems in mechanics |

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**END SEMESTER EXAMINATION – MAY / JUNE 2025**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **24CE1003** | **Duration** | **3hrs** |
| **Course Title** | **SUSTAINABLE BUILDING MATERIALS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **M** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Write the standard dimension of brick size. | | CO1 | U | 1 |
| 2. | List any two uses of glass in construction. | | CO1 | R | 1 |
| 3. | Specify the broad classification of foundation. | | CO2 | R | 1 |
| 4. | Recall the applications of painting. | | CO2 | U | 1 |
| 5. | Give any two example of a natural building material. | | CO3 | U | 1 |
| 6. | Identify the main benefit of using non-toxic adhesives in construction. | | CO3 | R | 1 |
| 7. | Enlist the any one advantages of using Sandwich Panels in construction. | | CO4 | U | 1 |
| 8. | Name one material commonly used in composite beams and panels. | | CO4 | R | 1 |
| 9. | Tell the primary use of shipping containers in construction. | | CO5 | U | 1 |
| 10. | Indicate one application of piezoelectric materials in construction. | | CO6 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | List three characteristics of stones used in construction. | | CO1 | An | 3 |
| 12. | Mention the purpose of damp proofing in buildings. | | CO2 | U | 3 |
| 13. | Define low VOC paints and why are they important for sustainability? | | CO3 | An | 3 |
| 14. | Define filter slabs, and how do they contribute to sustainability? | | CO4 | U | 3 |
| 15. | Name three types of waste materials that can be reused in construction. | | CO5 | An | 3 |
| 16. | Write the concept of self-healing concrete and its applications. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No. 17 to 23, Q.No. 24 is Compulsory)** | | | | | |
| 17. | a. | Describe the composition, properties, and applications of cement in construction. | CO1 | An | 6 |
| b. | Enumerate the types of plastics used in building construction and their advantages | CO1 | An | 6 |
|  |  |  |  |  |  |
| 18. | a. | Discuss the different types of roofs and roof coverings. Explain their functions and materials used. | CO2 | A | 6 |
| b. | Explain the methods and importance of plastering and pointing in buildings. | CO2 | A | 6 |
|  |  |  |  |  |  |
| 19. | a. | Highlight the importance of using salvaged and recycled materials in sustainable construction. | CO3 | An | 6 |
| b. | Assess the advantages and disadvantages of using bio-based building materials. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 20. |  | Examine the benefits and applications of Ferro-cement walls and vaulted roofs in sustainable construction. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 21. |  | Explain how geopolymer concrete contribute to sustainable construction. | CO5 | U | 12 |
|  |  |  |  |  |  |
| 22. |  | Summarize the advantages and applications of Compressed Stabilized Earth Blocks (CSEB) in sustainable construction. | CO4 | U | 12 |
|  |  |  |  |  |  |
| 23. |  | Illustrate the role of non-toxic materials, such as low-VOC paints and adhesives, in improving indoor air quality. | CO3 | R | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Define smart concrete. Explain its working principle and benefits in construction. | CO6 | A | 6 |
| b. | Elaborate bacterial concrete and its role in enhancing the durability of structures. | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL **M** – MARKS ALLOTTED

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| **CO1** | Select the sustainable building materials |
| **CO2** | Distinguish between conventional and modern construction materials |
| **CO3** | Define the concepts of embodied carbon or carbon footprint |
| **CO4** | Apply different sustainable construction techniques |
| **CO5** | Analyze the usage of waste materials for construction |
| **CO6** | Identify the use of smart materials |