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| **Semester : IV** | **Date :** **01/July/2024** |
| **Course Code : CIV2015** | **Time :9.30 AM to 12.30 PM** |
| **Course Name :** **Geotechnical Engineering** | **Max Marks :100**  |
| **Program:** **B.Tech. Civil & V** | **Weightage :50%** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

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| **PART A** |
|  **ANSWER ANY 4 QUESTIONS 4Q X 5M=20M** |
| 1 | The soil deposits of India may be classified in to five major groups. Black cotton and alluvial soils are the major groups found in India. Explain Black cotton soil and alluvial soils. | (CO 1) | [Knowledge] |
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| 2 | The soil sample is procured from a construction site and its water content is 10% and bulk density is 1.6 g/cc then find its dry density. | (CO 1) | [Knowledge] |
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| 3 | Coefficient of permeability of soil can be determined by Darcy’s law. State Darcy’s law and its assumptions.  | (CO 2) | [Knowledge] |
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| 4 | Coefficient of percolation and coefficient of permeability of soil are related to each other. Establish the relationship between them. | (CO 2) | [Knowledge] |
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| 5 | Consolidation and compaction are the two important parameters in soil. List the difference between them and also explain primary and secondary consolidation. | (CO 3) | [Knowledge] |
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| 6 | List the various types of consolidation settlement of soil and explain any one of them | (CO 3) | [Knowledge] |
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| **PART B** |
|  **ANSWER ANY 4 QUESTIONS 4Q X 10M=40M** |
| 7 | A cohesive soil yields a maximum dry density of 1.8g/cc at an optimum moisture content (omc) of 16% during a standard proctor test. If the value of specific gravity 2.65, what is the degree of saturation? What is the maximum dry density further it can be compacted to? | (CO 1) | [Comprehension] |
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| 8 | The soil which exhibits same properties are grouped together and are classified. A soil from a construction site at Hubli is to be classified. Classify the soil according to IS soil classification system with group symbol from the given data i) Percentage of soil passing 75micron sieve =48%, ii) Percentage of coarse fraction passing 4.75mm sieve=88%, iii)Uniformity coefficient (Cu) = 8 and coefficient of curvature Cc=2.5  | (CO 1) | [Comprehension] |
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| 9 | Permeability is an engineering property of soil which allows the water to flow through it. List and explain the factors affecting soil permeability.  | (CO 2) | [Comprehension] |
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| 10 | A sand sample of 35 cm2 cross sectional area and 20 cm long was tested in a constant head permeameter. Under a constant head of 60 cm, the discharge was 120 ml in 6 minutes. The dry weight of sand used for the test was 1120 g, and Gs = 2.68. Determine the coefficient of permeability and the seepage velocity. | (CO 2) | [Comprehension] |
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| 11 | Sudden reduction in volume of soil takes place with sudden application of loads and this process is known as compaction. There are various factors which affect compaction. Explain factors affecting compaction. | (CO 3) | [Comprehension] |
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| 12 | Compression of soil is due to the escape of water when external load is applied is called Consolidation. Explain Mass spring analogy of soil consolidation with a neat diagram.  | (CO 3) | [Comprehension] |
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| **PART C** |
|  **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** |
| 13 | From a construction site near Nagarbhavi, the soil is procured and the sieve analysis is carried out. Following table show the results of sieve analysis. Determine its coefficient of uniformity and coefficient of curvature of the soil. Also determine the gradation of the soil from the graph.

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| Percentage Finer | 82.78 | 66.11 | 49.44 | 33.88 | 21.1 | 11.1 | 8.32 |
| Particle size | 4.75mm | 2mm | 1mm | 0.6mm | 425 micron  | 150 micron | 75 micron |

 | (CO 1) | [Application] |
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| 14 | The diagram shown below is the profile of the ground at a construction site at Rajanukunte from soil investigation report. Calculate and plot the total stress, pore water pressure and effective stress diagram for the soil profile shown in Fig.   | (CO 2) | [Application] |
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| 15 | For the construction of Bengaluru-Mysore highway road, the subgrade compaction properties need to be evaluated. Soil is brought to the laboratory and standard compaction test was performed. The following table gives the Standard Proctor compaction test results. Draw the compaction curve using the graph sheet and determine maximum dry density and optimum moisture content of the soil. Volume of the mould is 1000 cc, mass of mould is 1000 g and specific gravity is G=2.6.

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| --- | --- | --- | --- | --- | --- |
| Mass of mould+wet soil (g) | 2665 | 2996 | 3189 | 2990 | 2550 |
| Water Content (%) | 15 | 18 | 25 | 30 | 34 |

  | (CO 3) | [Application] |
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