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| **Name:**<br>**Enrolment No:** | UPES<br>UNIVERSITY WITH A PURPOSE |

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**
**Online End Semester Examination, December 2020**

**Course: Geotechnical Engineering** **Semester: V**
**Program: B Tech Civil Engineering** **Time 03 hrs.**
**Course Code: CIVL 3020** **Max. Marks: 100**

**SECTION A**

| S. No. | | Marks | CO |
|---|---|---|---|
| Q 1 | Factors affecting soil formation are _____, _____, _____, _____, _____. | **5** | **CO1** |
| Q 2 | Earth slopes are formed for railway _____, _____embankments, _____ dams, canal _____, _____. | **5** | **CO2** |
| Q 3 | Soil water is broadly classified into _____ water and _____ water.<br>Held water is divided into three types _____water, _____water and _____water. | **5** | **CO3** |
| Q 4 | Shear strength is the principal engineering property which controls the _____ of soil mass under _____. It governs the _____ capacity of soils, the stability of _____ in soils and earth pressure against retaining structures. | **5** | **CO4** |
| Q 5 | a) The property of the soil due to which, a _____ in volume occurs under compressive forces is known as _____ of soil.<br>b) The compression of soils can occur die to one or more of the following: _____ of solid particles and water in the voids, compression and _____ of air in the voids, expulsion of _____ in the voids. | **5** | **CO5** |
| Q 6 | Soil classification is done by_____, _____, _____, _____, and _____ systems. | **5** | **CO1** |

**SECTION B**

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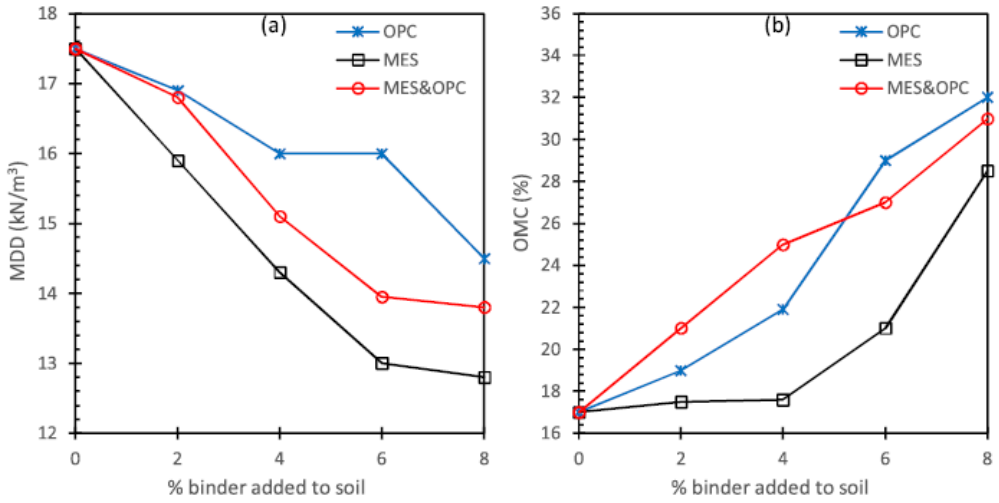
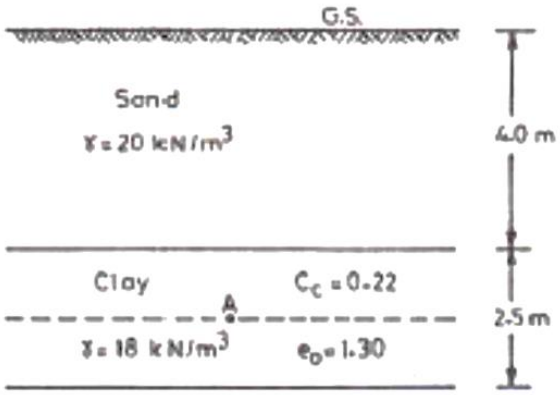
| Q 7 | One kg of soil was sieved through a set of 8 sieves, with the size of 4.75 mm, 2.0 mm, 600 µ, 425 µ, 300 µ, 212 µ, 150 µ and 75 µ. The mass of soil retained was found to be 50, 78, 90, 150, 160, 132, 148 and 179 gm respectively in each sieve. Calculate Coefficient of uniformity and coefficient of curvature. | **10** | **CO1** |
| Q 8 | Explain types of slope failures with neat sketches. | **10** | **CO2** |

<table>
<tr><td>Q 9</td><td> 

From the graph above, Comment on the characteristics of MDD and OMC of the soil stabilized with the above binders from a research work. Also state their applicability. (OPC-ordinary Portland cement) (MES- Milled Egg Shell)</td><td>10</td><td>CO3</td></tr>
<tr><td>Q 10</td><td>A series of direct shear tests was conducted on a soil, each test was carried out till the sample failed. The following results were obtained.
<table>
<tr><td>Sample No.</td><td>Normal stress (kN/m$^2$)</td><td>Shear stress</td></tr>
<tr><td>1</td><td>15</td><td>18</td></tr>
<tr><td>2</td><td>30</td><td>25</td></tr>
<tr><td>3</td><td>45</td><td>32</td></tr>
</table>
Determine the cohesion intercept (C) and the angle of shearing resistance (φ).</td><td>10</td><td>CO4</td></tr>
<tr><td>Q 11</td><td>Calculate the final settlement of the clay layer shown in figure due to an increase of pressure 45 kN/m$^2$ at mid height of the layer. Take $\gamma_w$= 10 kN/m$^3$.

</td><td>10</td><td>CO5</td></tr>
<tr><td colspan="4">SECTION-C</td></tr>
<tr><td>Q 12</td><td>A soil profile consists of a surface layer of sand 3.0 m thick (ρ = 1.65 gm/cc), an intermediate layer of clay 3.0 m, thick (ρ=1.95 gm/cc) and the bottom layer of gravel 2.5 m thick (ρ=1.93 gm/cc). The water table is at the upper surface of the clay layer. Determine the effective pressure at various levels immediately after placement of a surcharge load of 60 kN/ m$^2$ to the ground surface.<br>(OR)<br>Explain the method for determination of coefficient of permeability using constant and variable head permeability test. Also state the limitations of these test methods.</td><td>20</td><td>CO3</td></tr>
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