Geology and Soil Mechanics
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Lecture - 06
Index Properties of Soil- D

Welcome to the course Geology and Soil Mechanics. So, in the last lectures, couple of lectures we have seen, we have solved basically 3 problems and then we will be taking the fourth problem on the relative density calculation.

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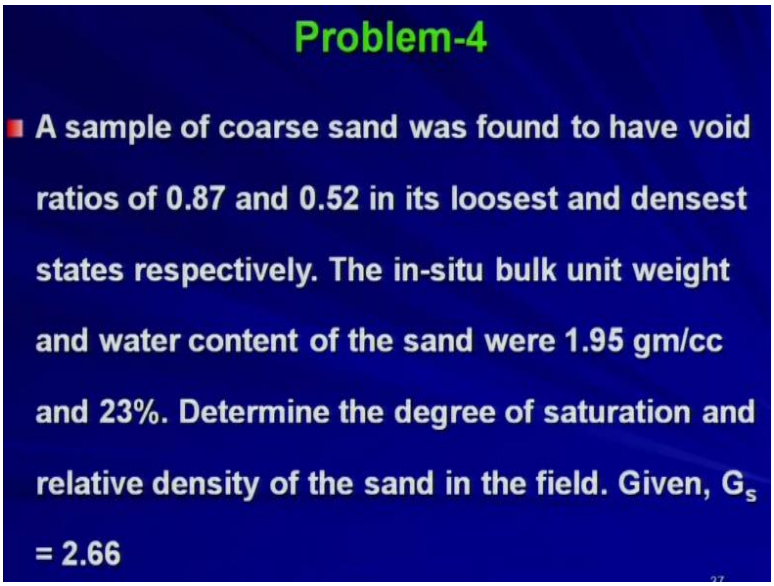

The problem 4 says a sample of coarse sand was found to have void ratios of 0.87 and 0.52 in its loosest and densest states respectively okay. The in-situ that means the e max is 0.87 and e min is 0.52, if you recall, the expression for your relative density. The in-situ bulk unit weight and water content of the sand were 1.95 gm/cc and 23%.

Determine the degree of saturation and relative density of the sand in the field, given the specific gravity of the soil solid G s is equal to 2.66. So basically, you need to determine two, two things, one is your degree of saturation, another one is the relative density and given the loosest void ratio as well as the densest state void ratio okay.

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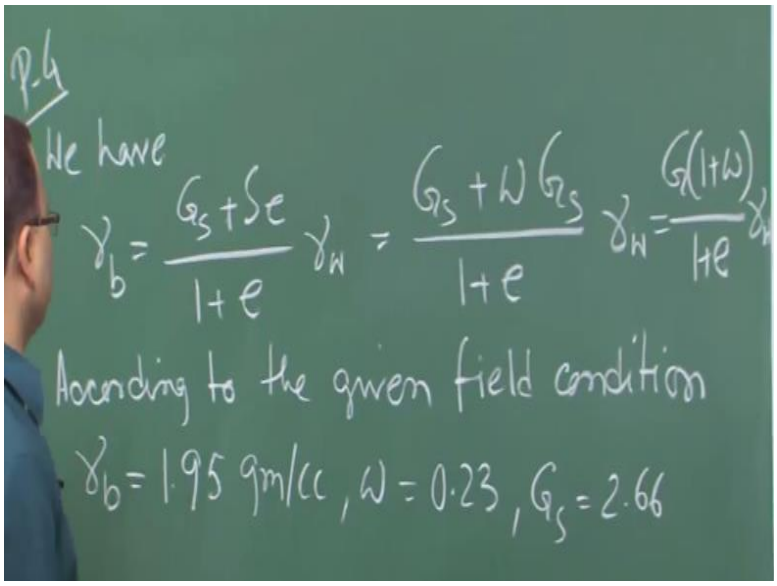

So, let us solve this problem, problem 4. Now we have from the definition of the different parameters that is the gamma basically that is your bulk unit weight is given by G s plus S into e that is the degree of saturation multiplied by the void ratio by 1 plus e. Again, you can establish that thing. We are not going to that detail okay. That means establishing all these relation because you will be getting plenty of such kind of relation.

You can establish the relation among all the parameters okay so which sorry the gamma w will be coming into the picture here which is equal to G s plus water content multiplied by G s because S e is nothing but water content multiplied by G s already we have seen in the last problem or last to last problem by 1 plus e into gamma w which can be written as G into 1 plus w by 1 plus e into gamma w.

So, this is the relation we can establish among these parameters and from this few say parameters are known to you from the problem so you need to find out the water content. So according to the given field condition we have gamma b, if you look at the problem you will see all the parameters, 1.95 gm/cc, w is 0.23 that is the water content is 0.23 that is 23% and G s is 2.66.

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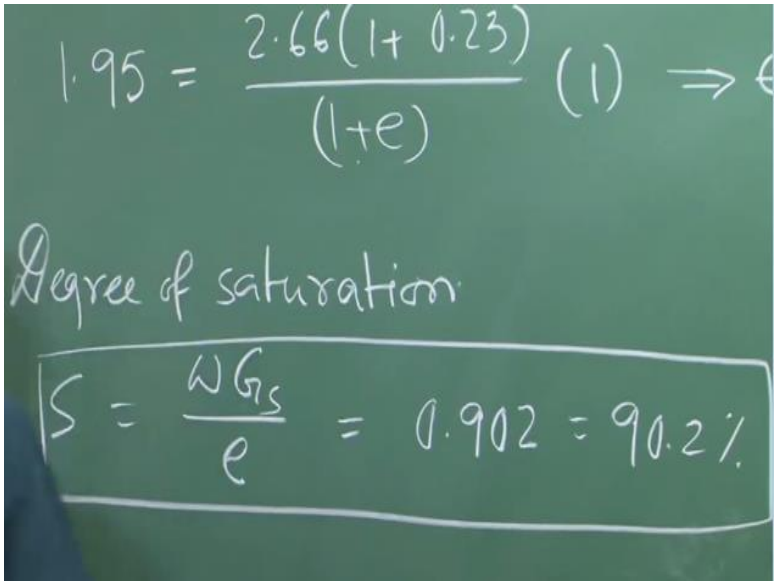

Now with this values we can put in this expression 2.66, 1 plus 0.23 divided by 1 plus e into 1 from which I can get the void ratio is equal to 0.678. So, this is the void ratio as per the problem given in the lecture okay. So therefore, degree of saturation S can be written as already we know from our definition so S e is equal to w into G s. So, from this if we put the values we will be getting S equal to 0.902 that means 90.2% okay. So, you have got the degree of saturation for that problem. Now let us find out the relative density.

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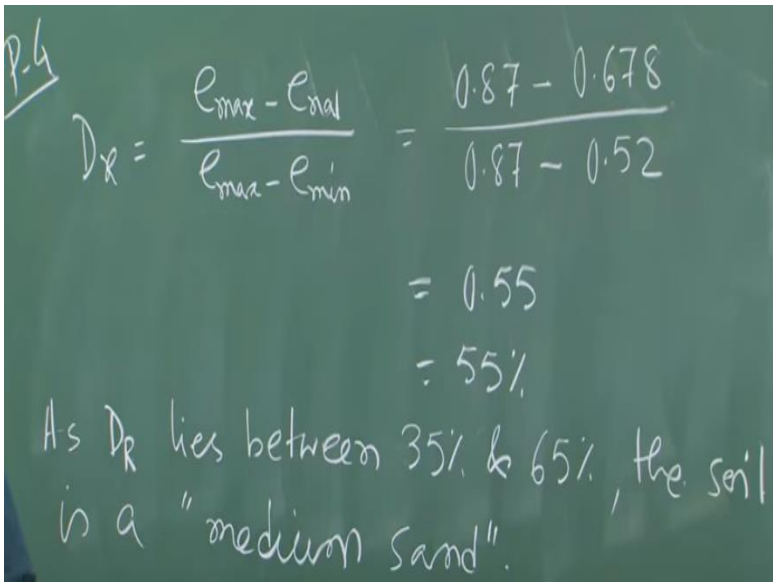

The relative density is given by D R is equal to you know that e max minus e natural by e max minus e min okay. So, this is the expression whatever we have seen in the lecture. Now what is the magnitude of e max that is given in the problem that is at the loosest state void ratio that is

0.87 minus e natural. What is the magnitude of e natural? E natural is nothing but whatever value you have just got it right. So that is the void ratio in the field condition, so 0.678 divided by 0.87 and what is the magnitude of e min that is also given in the problem that is 0.52.

So, if you calculate the value it will be coming as so that is 55%. Now if I ask you to categorise this type of sand because this is a cohesionless soil that means sand at this moment we are not talking about the cohesionless because we have not covered what is cohesion and all anyway so this is the coarse sand. So, this coarse sand is having the relative density of 55%.

Now if you recall whatever we have seen in the table, some table was given in the lecture that based on that you can categorise this sand and this sand actually as D R lies between 35% and 65%, the soil is a medium sand, medium dense sand okay. So, from the table itself we can categorise the sand is like this because 35 to 65 percent if your relative density falls then your soil will be or the sand will be categorised as medium sand okay. So that is all about your problem 4. So now we will be continuing with the soil classification system and clay mineralogy.