Irrigation and Drainage
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Lecture - 45
Tutorial

So this is the lecture number 45 on Tutorial, whatever we will end in this week there are some problems we will going to solve.

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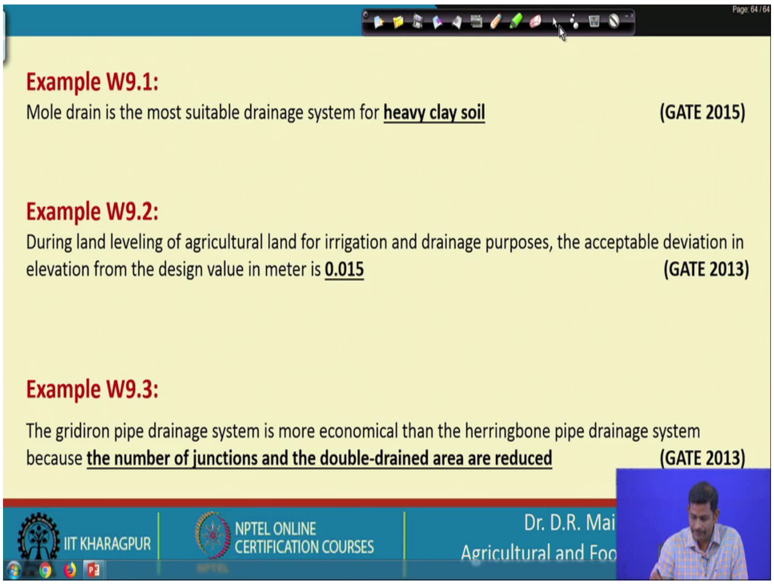

So, you see the example 9.1 in this. So, for example, a mole drain is the most suitable drainage system for heavy clay soils ok. So, this remember this, because the mole drain is a particular or the special kind of drain, which will be used to have make drains in a heavy clay soils, because it consists of a vertical bullet kind of you know the tool. So, which goes inside and the bullet makes you know kind of a round holes and this is the sharp right.

So, this kind of tool so, this opening whatever the opening which is taking place this will not collapse because of the clay soil and you can easily install the pipes here ok. So, that is the speciality of this mole drain and in the example 2, during land levelling of agricultural land for irrigation drainage purposes, the acceptable deviation, in elevation from the design value in metre is 0.015 or 1.5 percent. So, this we just remember and example 3, the gridiron pipe drainage system is more economical than the herringbone pipe drainage system, because the number of junctions and the double drained area are reduced.

So, this we have already discussed, the gridiron, that is the parallel grid system or drainage system is more economical than herringbone, because the herringbone consists of lot of joints and also this is a, it is problem with the double drainage. So, it because the shape ok, the shape of drainage.

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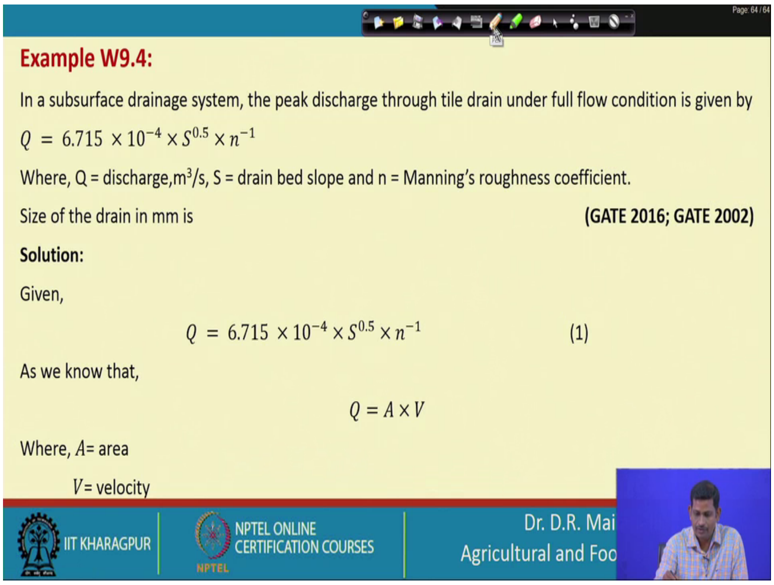

And then, so example 4, so in a subsurface drainage system, the peak discharge through a tile drain under full flow condition is given by Q is equal to 6.715 into, 10 power minus 4, into S power 0.5, into n power minus 1. So, this is equation given, where Q is the discharge in meter cube per second.

S drain bed slope and n Manning's roughness coefficient, size of the main drain. So, find out the size of the main drain in mm so, this is the question. So, Q is given right, so since, it is sub surface drainage system, so we consider this is you know circular drain pipe this circular drain pipe. So, let us see, this is a given Q is equal to 6.715 into 10 power minus 4 and S power, 0.5 into 10 power minus 1. This is the Manning's equation, we know that Q is equal, to A into V where A is area and V is velocity.

So let us, put the Manning's equation into this equation and considering the circular pipe and we can get an equation equivalent to this form right, and then you can get the values of n and other values, values of the size of the drain ok.

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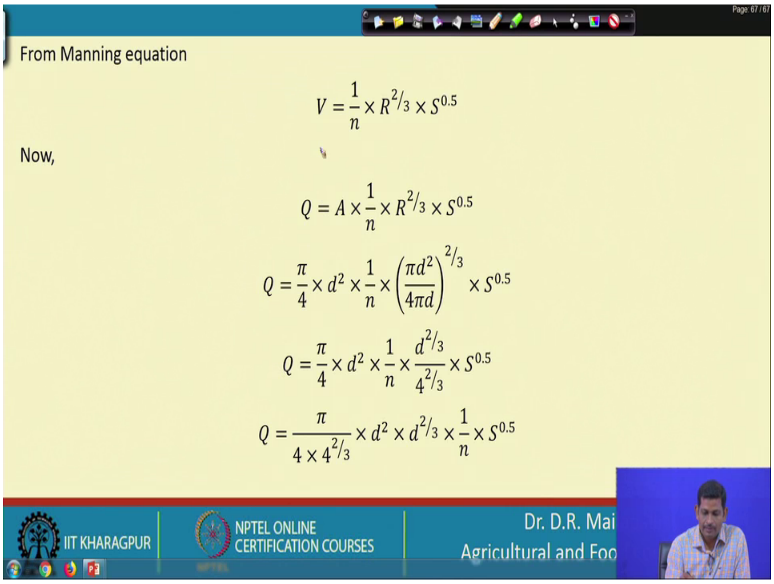

Let us say dso, here put the Manning's equation that is let us say V equal to 1 by n into R power 2 by 3 and S power 0.5 and so go, Q is equal to A into V right. So A into V, this is V 1 by n, R power 2 by 3 into S power 0.5.

So, A is so this is the cross sectional area pi by 4 d square ok, 1 by n. So, this is R, R is equal to A by P ok. So, A is pi d square by 4 and P is a perimeter. So, if you remember this is the perimeter this is the base, so it is the parameter is half circle so, that is pi d ok. So, this way you get pi d square by 4 pi d and S power 0.5. Now simplify, this point pi by 4, into d square and 1 by n, d square d power 2 by 3 A by 4 by 4 power, 2 by 3, S power 0.5.

And finally, Q is equal to pi by 4 into 10 power 4 by 2 by 3 d square. So, you have to simplify this.

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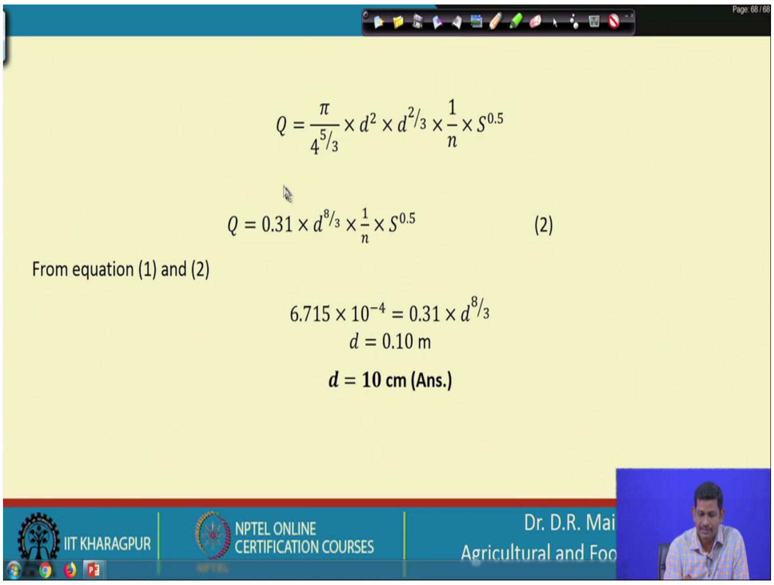

And after simplification, you will get the equation this form, pi by 4; 4 power 5 by 3, d square, d power 2 by 3, 1 by n, S power 0.5 and the given equation is cube Q is equal to 0.31 into d power 8 by 3, 1 by n, S power 0.5 ok.

So, this look at this similarities here and the remove the terms which are having the, say like 1 by n, 1 by n gets cancels out and what else S power, S power this cancels out. So, then equate these two right, and the rest on the parameter is d and d can be estimated by equating these two equations and d is equal to 10 centimetre ok.

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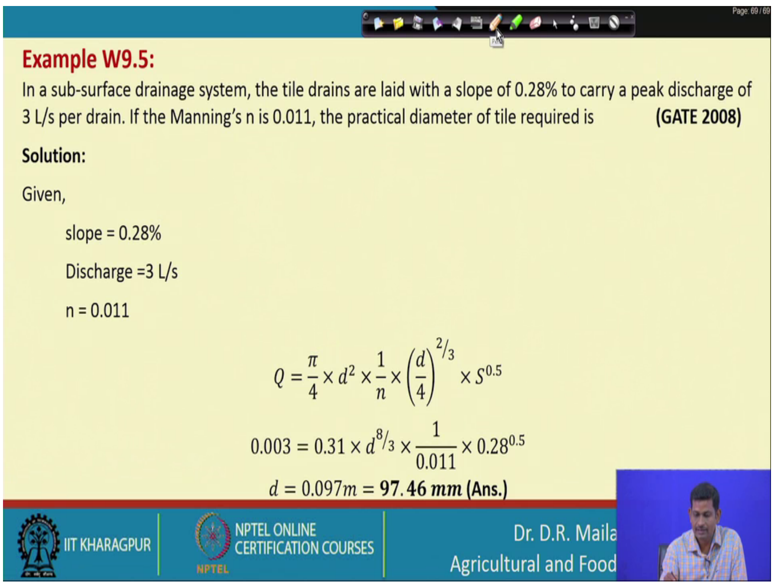

Alright so, there is example 5. In a subsurface drainage system, the tile drains are laid with a slope of 0.28 percent right and to carry a peak discharge of 3 litre per second per drain.

If the Manning's n is 0.0011, the practical diameter of the tile required is, so given, that the slope is 0.28 percent and discharge 3 litre per second and n, the is slope 0.011 right and you have this equation by Manning's equation. So, so this is area A right, 1 by n and d by 4, 2 by 3 from the previous example and S power 0.5. So, putting the values Q is given, metre cube per second and 0.31 ok. So d power 8 by 3 and. So, except d all other parameters are known.

So, suiting the other parameters, we can get, d as 0.097 or 97.46 mm ok.

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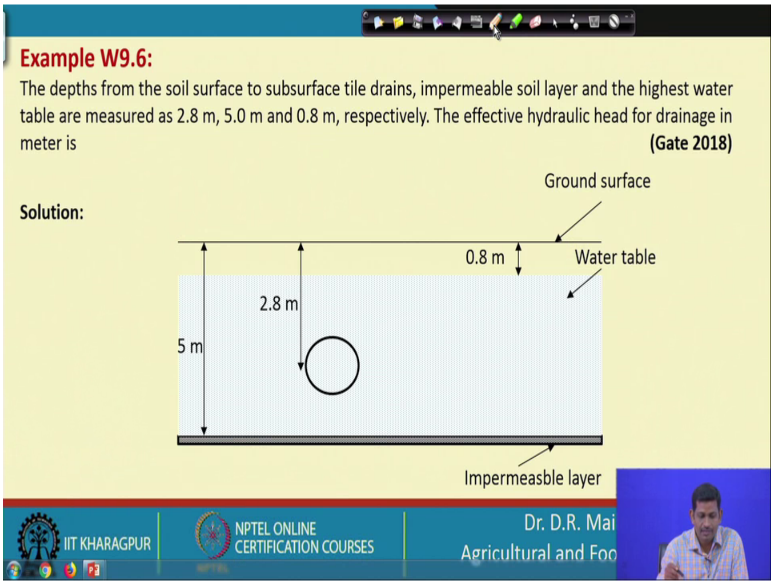

So, here is example 6, the depths from the soil surface to subsurface tile drains, in impermeable soil layer and the highest water table are measured right 2.8. So, this is a depth to tile drain right, on the base and then impermeable surface, this is impermeable impervious or impermeable surface and then and 0.8 is the highest water table. So, we are expecting the water table to be, like this is the highest water table.

So, the effective hydraulic head for drain drainage in metres is so, what is effective hydraulic head. So effective hydraulic head, how do you get it? So, that is let us say, that is 0.8 meter. So, the hydraulic head will be, this is h. So, that simply, you can subtract, 2.8 minus 0.8 you get you know h.

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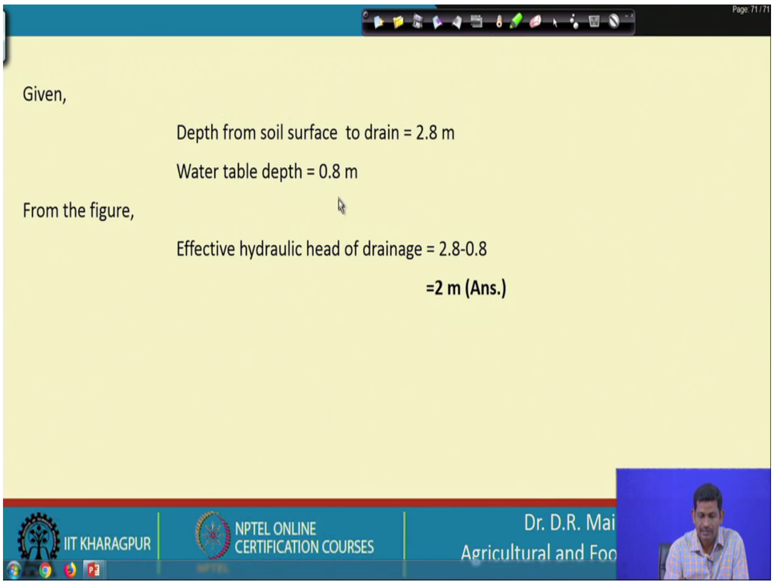

So as I said, is a depth to surface drain is 2.8, water table 0.8. So, effective hydraulic head is 2.8 minus 0.8 that is 2 meter.

So, these are the examples, some of the examples related to your this week's lectures, so in these examples. So, mostly we covered some of the problems given in GATE examination. So, so the mainly, the knowing the you know, the drainage characteristics will be estimating the drain pipe diameter ok. So, that is the one thing and the other one is mole drainage.

So why what is mole drainage and then in the calculations, what in drainage calculations. What is the percentage error, we can you know commit that is a one thing right and then finally, so the mostly, we will be talking about you know the head, which is maintained in the middle right. So in the last example, so what is effective hydraulic head, so with I think this problems will be enough to cover the last previous, I mean this week's lectures and you can also go through some other problems in the referred textbooks ok

Thank you so much.