Iden.3108   **Drainage Engineering (1+1)**   **Marks: 50**
Time: 2 hours

I   **State True or False**   **(10x1=10)**
1. Stream lines are always Parallel to isobaths.
2. Darcy's law is completely valid for flow through unsaturated porous medium.
3. Drain installation commences from the most downstream side and proceeds upstream.
4. Filters are recommended for Subsurface Drainage System in case of non-cohesive soils with clay content less than 40 %.
5. In gridiron system of SSD, laterals meet the main from both the sides.
6. Design capacity of the drains is essentially based upon crop to be grown.
7. Constant head permeability method is an *in situ* method of soil permeability determination.
8. Porosity of clay soil is less than sandy soil.
9. Drainage coefficient is also known as drainage modulus.
10. Intrinsic permeability depends on properties of both media and fluid.

II   **Write short notes on ANY FIVE of the following**   **(5x2=10)**
1. State the Anthropogenic causes of water logging of agricultural fields.
2. Explain Mole Drainage with neat sketch.
3. State and explain the salt balance equation for irrigated lands with neat sketch.
4. Enlist the benefits of Subsurface Drainage System (SSD) installed in irrigation command area.
5. Write down the difference interceptor drains and relief drains with neat sketches.
6. Enlist the factors influencing the movement of water into the subsurface drains.
7. Compute the drainage coefficient of 200 ha agricultural land if the drainage channel installed there, discharges water at the rate of 0.1 m^3/s while draining.

III   **Answer ANY FIVE of the following**   **(5x4=20)**
1. Derive Ernst's equation for the spacing the drains.
2. Explain in detail CN method for the computation of design discharge of drainage system.
3. Enlist the methods for determination of soil permeability. Explain Auger-Hole Method in detail with neat sketch.
4. What is the conjunctive use of fresh and saline water? Explain the advantages.
5. Enlist and explain supplemental structures in tile drainage system.
6. Define Surface Drainage. Enlist various methods to drain-out surface water from waterlogged areas. Explain the Bedding Field Drain System with schematic diagram.
7. Explain drainage coefficient in detail.
Drainage coefficient of an area is 6.6 cm. The catchment area is 6 sq. km. Design a main open drain with bed slope of 0.1 %, assuming the value of Manning's coefficient to be 0.03. Type of soil permits the side slope of 1.5:1. Depth of the drain at outlet cannot exceed 1.5 m based upon the area topography and elevation of outlet.

IV   **Write an essay on ANY ONE of the following**   **(1x10=10)**
1. Define water logging. Enlist adverse effects of water logging and salt accumulation. Explain various causes of water logging in detail.
2. Write a detailed note on "Drainage Investigations".

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