



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech(GET)/SEM-1/GTE-113/2011-12

2011

FLOW THROUGH POROUS MEDIA

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer any *five* questions.

$5 \times 14 = 70$

(The questions are of equal value)

1. a) Explain the factor on which capillary rise in soil depend.
Derive the expression connecting the capillary rise and surface tension.
- b) Describe the domain of validity of Darcy's law in flow problems in civil engineering.
2. Write short notes on the following :
 - a) Bottleneck effect
 - b) Application area of fluid flow in porous medium.



- c) Various expressions for coefficient of permeability of soils
 - d) Various entrance and emergence conditions of line seepage.
3. Describe the soil moisture-suction relationship using Fayeze's relation. Plot variation of suction with water content varying between 20% and 70% for different soils.
4. State the assumptions in deriving Laplace's Equation for steady state flow of fluid through saturation porous medium and hence develop the governing equation.
5. a) Prove that flow lines intersects the equipotential line orthogonally.
- b) State with reference to sketches, different boundary conditions which exist for the earth dam under steady state seepage.
6. Explain any two methods of solving Laplace's Equation for flow through saturated porous medium.



7. Develop expression for top flow line in earth dam theoretically and also graphically by Cassegrande's method.

What are the roles of toe filter in this respect ?

8. Explain the method of finding discharge through an earth dam with $K_x = 9 \times 10^{-3}$ cm/sec and $K_z = 2 \times 10^{-3}$ cm/sec.

