Total No. of Questions :8] *[Total No. of Printed Pages :2*

Roll No .....

MVCT/MBCT/MVCP-103

M.E./M.Tech., I Semester

Examination, December 2016

Advanced Geotechnical Engineering

Time : Three Hours

Maximum Marks : 70

Note : i) Answer any five questions.
ii) Assume data suitably wherever required

1. a) Discuss the westergaard's solution for stresses developed due to applied load in soil. 4
   b) What is isobar diagram? 3
   c) An elevated structure with a total weight of 10000 kN is supported on a tower with 4 legs. The legs rest on piers located at the corners of a square 6m on a side. What is the vertical stress increment due to this loading at a point 7m beneath the centre of structure. 7

2. a) What is penetration sampling? Describe the concept of electrical resistivity method. 7
   b) The liquid limit of a normally consolidated clay is 80%. What are its approximate compression index C_c and secondary compression Index C_a value. 7

3. a) Draw neat figure of typical well foundation and show its various components. Discuss the parameter responsible for deciding depth of well foundation. 7
   b) Explain the term sinking of well, well steining and tilt. 7

4. a) A blind cylindrical hole of diameter 2cm and length 3cm is drilled into a metal slab having emissivity 0.6, if the metal slab is maintained at a temperature of 350°C, find the heat escaping out of the hole by radiation.
   b) What is meant by view factor? When is the view factor of a surface to itself equal to zero.

5. Hydrogen gas at 2 bar, 25°C is flowing through a vulcanised rubber tube, 30mm ID, 50mm OD solubility of H_2 in rubber is $0.053 m^2$ of H_2 per atm. per m^3 of rubber at 25°C. Diffusivity of H_2 through rubber is 10×10^{-11} m^2/s. Density of H_2 is $0.0899 kg/m^3$ at 1 bar pressure at 0°C. Calculate percentage reduction in H_2 loss if the rubber pipe is covered by 2.5mm thick steel tubing. Assume diffusivity of H_2 through steel as $1.0 \times 10^{-12} m^2/s$ at 25°C.

6. a) State the general differential equation for steady state heat conduction in cylindrical and spherical co-ordinates.
   b) Explain the difference between natural and forced convection in laminar and turbulent flow.

7. a) Explain the following:
      i) Black body and Gray body
      ii) Thermal Radiation
   b) State Fick's law of mass transfer by diffusion and explain its analogy with Fourier's law of conduction.

8. Write short note on (any three)
   a) Diffusion coefficient
   b) Steady and unsteady state heat transfer
   c) Buckingham π-theorem
   d) Modified latent heat of evaporation

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