Code: 9D12102

M.Tech I Semester Regular & Supplementary Examinations January/February 2017

THEORETICAL SOIL MECHANICS

(Geotechnical Engineering)

Time: 3 hours Max. Marks: 60

Answer any FIVE questions
All questions carry equal marks
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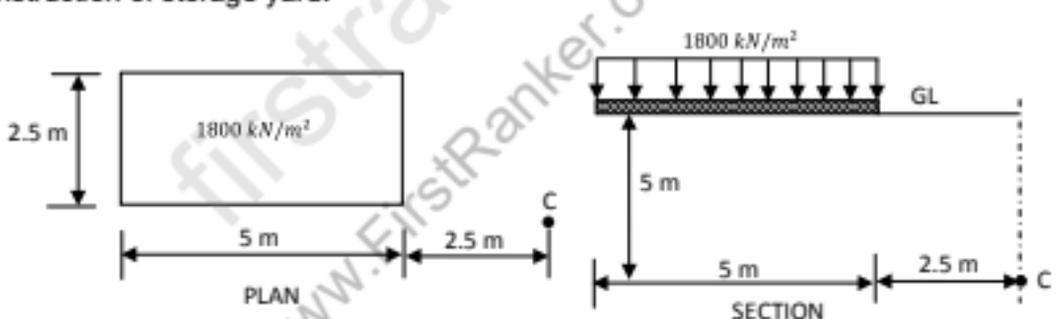
1 (a) Mention any two examples where plane strains are encountered in geotechnical engineering.
(b) Derive the compatibility equation from basic principle in terms of stress for a 2D problem.

2 At a point in a soil mass, the stresses are as follows:
$\sigma_x = 25\ N/m^2$; $\tau_{xy} = 30\ kN/m^2$
$\sigma_y = 40\ N/m^2$; $\tau_{yz} = -6\ kN/m^2$
$\sigma_z = 25\ N/m^2$; $\tau_{xz} = -10\ kN/m^2$
Determine the principle stresses and also the octahedral normal and shear stresses.

3 A clay sanitary pipe is located at a point C which is at a depth of 5 m below the ground. The pipe can withstand maximum external pressure of 100 kN/m^2. A storage yard of size 5 m x 2.5 m is to be constructed which will exert a pressure of 1800 kN/m^2 at the ground level as shown in figure below. With necessary calculations, check whether the storage pipe can sustain the pressure due to the construction of storage yard.



4 Mention Von Mises yield function. Explain Von Mises yield criteria with a neat sketch and also explain how to determine octahedral normal stress from the yield surface.

5 Compare Mohr-Coulomb, Tresca and Von Mises yield functions on the octahedral plane.

6 Explain time domain rule and frequency domain rule for linear rheological models.

7 Explain the following terms:
(a) Plain strain.
(b) Plane stress.
(c) Density hardening.
(d) Principle of superposition.

8 Applying upper bound theorem, deduce the ultimate bearing capacity (q_u) of a strip footing resting on the surface of a clayey deposit ($\phi = 0$) is $q_u = 6.28\ C_u$.

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