

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M.TECH DEGREE EXAMINATION

Civil Engineering

(Geomechanics and Structures)

04 CE 6303 Theoretical Geomechanics

Max. Marks : 60

Duration: 3 Hours

Part A

Answer all questions

Each question carries 3 marks

1. Explain spherical stress matrix and deviator stress matrix.
2. Explain vertical stress distribution on a vertical plane.
3. Explain Burmister's two layer theory.
4. Give a brief description of rheological models.
5. Explain Mohr-Coulomb failure criteria.
6. Write a brief note on hollow cylinder test.
7. Explain anisotropic plastic models.
8. Describe elastic perfectly plastic model.

Part B

Each question carries 6 marks

9. At a point in a body the components of strain tensor are $\epsilon_x=0.001$, $\epsilon_y=-0.003$, $\epsilon_z=0.002$, $\gamma_{xy}=0.001$, $\gamma_{yz}=0.0005$, $\gamma_{xz}=-0.002$. Determine the principal strains and principal strain directions.

OR

10. The state of stress at a point for a given reference axis xyz are $\sigma_x=50$, $\sigma_y=30$, $\sigma_z=15$, $\tau_{xy}=20$, $\tau_{yz}=5$, $\tau_{xz}=10$ Mpa. If coordinate system is rotated about z-axis in anticlockwise direction through an angle of 30° , Determine the new stress components with reference to $x'y'z'$ system. Also prove that the stress invariants remain unchanged.

11. A rectangular area $2m \times 4m$ carries a uniform load of $100kN/m^2$ at the ground surface. Find the vertical stress 5m below the centre and corner of the loaded area.

OR

12. Discuss the basis of the construction of Newmark's influence chart. How it is used.
13. A ring foundation is of 3.6m external diameter and 2.4 m internal diameter. It transmits a uniform pressure of 135 kN/m². Calculate the vertical stress at a depth of 1.8m directly beneath the centre of the loaded area. Use Westergaard's Analysis by taking $\mu=0$

OR

14. Explain with neat sketch the stress distribution around tunnels.
15. Explain rheological properties of materials.

OR

16. With the aid of rheological model simulate and explain the consolidation of soil.

17. Write short note on Tresca criterion.

OR

18. Write note on settlement computation.
19. Write short note on constitutive models in soil mechanics.

OR

20. Write short note on advances in constitutive models.