APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M. TECH DEGREE EXAMINATION

Civil Engineering

(Structural Engineering and Construction Management)

04CE6403—THEORY OF ELASTICITY

Max. Marks : 60 Duration: 3 Hours

PART A

Answer All Questions

Each question carries 3 marks

1. Briefly explain surface forces and body forces.
2. Write the stress strain relations for plane strain problems.
3. Explain St.Venant's principle and its applications.
4. Discuss the effect of geometrical irregularities on the distribution of stresses.
5. List the assumptions involved in Coloumb's theory for torsion of circular shafts.
6. Discuss Prandtl's stress function approach for the solution of twisted bars.
7. Explain Stress- strain curve for mild- steel up to rupture.
8. Write short note on plastic potential.

PART B

Each question carries 6 marks

9. The state of stress at a point in a material is given by $\sigma_x = \sigma_y = \sigma_z = 10\ N/mm^2$.$\tau_{xy} = 20\ N/mm^2$, $\tau_{xz} = \tau_{yz} = 10\ N/mm^2$. Find the principal stresses and the direction of major principal stress.

OR

10. Derive the equations of equilibrium in Cartesian coordinate system.
11. Show that the stress distribution is same for all isotropic materials in two dimensional state of stress.

OR

12. Derive the compatibility equation in terms of stresses. Explain its significance.
13. Briefly explain Airy's stress function approach in solving boundary value problems in elasticity.

OR

14. Using the stress function, $\phi = -\left(\frac{3F}{h^2}\right) xy^2 + \left(\frac{2F}{h^3}\right) xy^3$, find and plot the variations of stress components in a region included in $y=0$, $y=h$, $x=0$ and $x=L$.
15. Derive expressions for the radial and tangentive stresses in a thick cylinder subjected to internal and external stresses.

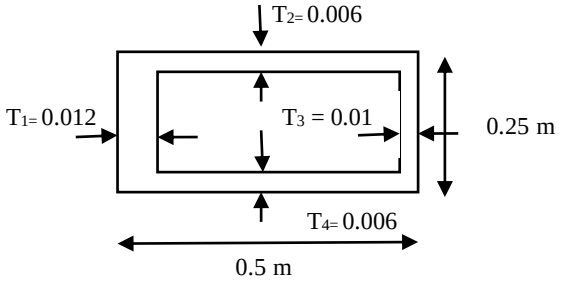
OR

16. Derive expression for the stresses in a rotating disc of uniform thickness and mass density.

17. Briefly explain Prandtl's membrane analogy.

OR

18. A hollow aluminium tube of rectangular cross section is subjected to a torque of *56,500* Nm along its longitudinal axis. Determine the shearing stresses and angle of twist. Take $G = 27.6 \times 10^9\ N/m^2$. *(*All thickness in metres)



19. Define,

    a) Rigid material

    b) Perfectly linear elastic material

    c) Rigid perfectly plastic material

OR

20. Explain yield criteria. Explain Tresca's yield criterion and Von Mises yield criterion.