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SAINTGITS COLLEGE OF ENGINEERING
KOTTAYAM, KERALA

(AN AUTONOMOUS COLLEGE AFFILIATED TO
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH. DEGREE EXAMINATION(S), JULY 2021
(STRUCTURAL ENGINEERING AND CONSTRUCTION MANAGEMENT)

Course Code: 20CESCT103

Course Name: THEORY OF ELASTICITY

Max. Marks: **60** **Duration:** **3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Illustrate the stress strain relation in matrix form
2. Express the stress strain relation for plane stress and plane strain case.
3. Briefly explain the expression for biharmonic equation in polar coordinates.
4. State lames equations for longitudinal and hoop stress in thick cylinder
5. List the analogous quantities in membrane analogy.
6. Explain briefly about St.Venant's theory of torsion.
7. State the assumptions made in yield line theory.
8. Define isotropic hardening.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. The following state of strain exist at a point $\varepsilon = \begin{bmatrix} 0.23 & 1.05 & 0.2 \\ 1.05 & 0.3 & -0.4 \\ 0.2 & -0.4 & 0.5 \end{bmatrix} MPa.$ (6)
If the coordinate axis is rotated about z axis through 45° in the anticlockwise direction determine the new stress components.

OR

10. Consider an isotropic material that is subjected to uniform stress. Show that the elastic constants are only two by generalized Hooke's law. (6)

MODULE II

11. Derive the compatibility equation for plane stress case. (6)

OR

12. Derive the strain displacement relations in polar co-ordinates. (6)

MODULE III

13. Show that the following Airy's stress function $\varphi = -\left[\frac{W}{2hd^3} xy^2(3d - 2y)\right]$ satisfies the biharmonic equation and examine the stress distribution represented by them (6)

OR

14. Describe the deflection equation for the bending of a cantilever loaded (point load) at the end and compare with strength of materials approach (6)

MODULE IV

15. Derive the governing differential equation and the stress components of a rotating disc of uniform thickness and mass density. (6)

OR

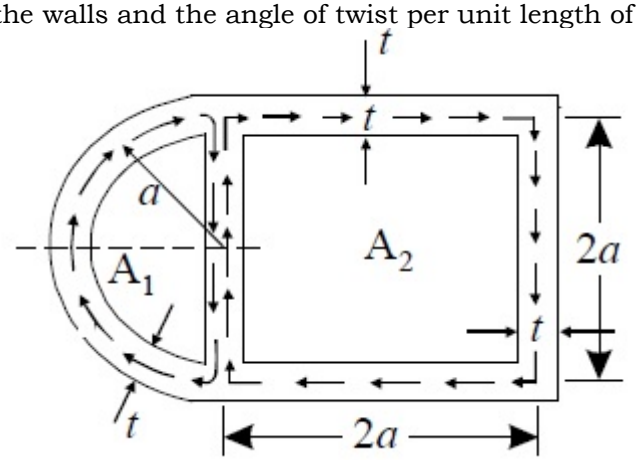
16. Explain the effect of circular hole in stress distribution of plates (6)

MODULE V

17. Using direct method, derive the expressions for magnitude of the shear stress components in an elliptic bar of size(2a,2b) subjected to Torque T. (6)

OR

18. A thin walled steel section shown in figure is subjected to a twisting moment T. Calculate the shear stresses in the walls and the angle of twist per unit length of the box. (6)



MODULE VI

19. Discuss in detail about the various failure theories of plasticity with its limitations. (6)

OR

20. Explain the elasto-plastic bending of beams, specially mentioning the difference between behaviour of symmetric and asymmetric sections. (6)

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