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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ANE) (Sem.-8)
THEORY OF ELASTICITY
Subject Code : ANE-414
M.Code : 70496

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.
4. Make suitable assumptions wherever required.

SECTION-A**1. Write briefly :**

- a) State the strain-displacement relations for a three dimensional strained body.
- b) What is plane stress problem?
- c) What do you mean by Airy stress function in two dimensions?
- d) Write down the compatibility equation in terms of stresses for a two dimensional problem in the absence of body forces.
- e) What is the effect of small circular hole in the centre of a thin strained plate?
- f) Describe the principle of photoelasticity.
- g) For what type of problems is it advantageous to use polar coordinates in the solution of elasticity problems?
- h) Sketch the six components of stress at a point in a three dimensional element of a strained body in rectangular coordinates.
- i) Write down the equilibrium equations in polar coordinates.
- j) What do you understand by Isoclinics, Isochromatics and Isopachics in photoelasticity?

SECTION-B

2. Stress function is given by :

$$\phi = \frac{Ax^4}{12} + \frac{Bx^3y}{6} + \frac{Cx^2y^2}{3} + \frac{Dxy^3}{6} + \frac{Ey^4}{12}$$

Determine the relation among constants for the stress function to be valid.

3. What do you mean by stress distribution symmetrical about an axis? Derive the compatibility equation for problems symmetrical about an axis in polar coordinates.
4. Consider the case of a body subjected to uniform hydrostatic pressure p with no body forces. Show that the equations of equilibrium and boundary conditions are satisfied for this case.
5. Knowing the state of stress at a point in a three dimensional strained body, derive the equation of stress ellipsoid. If all three principal stresses are equal and of the same sign, what is the geometric form of this ellipsoid?
6. A hollow cylinder with inner radius a and outer radius b is subjected to uniform pressure on the inner and outer radii of the cylinder given by p_i and p_o respectively.

Assuming the stress function : $\phi = A \log r + Br^2 + C$, determine the values of the constants A , B in terms of p_o , p_i , a and b .

SECTION-C

7. A cantilever of length l and depth $2h$ is in a state of plane stress. The cantilever is of unit thickness, is rigidly supported at the end $x = l$ and is loaded as shown in fig. 1.

Show that the stress function :

$$\phi = Ax^2 + Bx^2y + Cy^3 + D(5x^2y^3 - y^5)$$

is valid for the beam and evaluate the constants A , B , C and D .

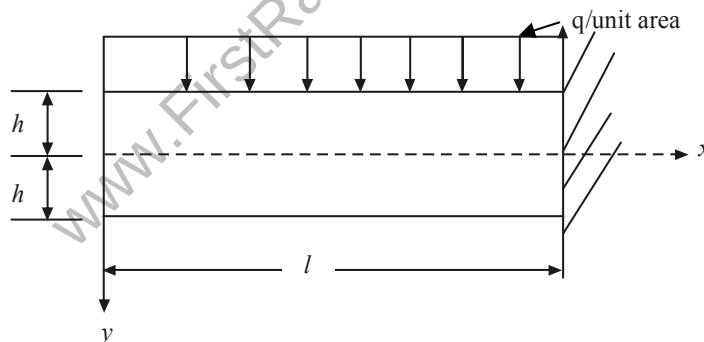


Fig.1

8. Sketch a transmission circular polariscope and explain its working. What is the basic advantage of a circular polariscope over a plane polariscope?
9. Determine the rate of twist and stress distribution in a circular section bar of radius R which is subjected to equal and opposite torque T at each of its free ends.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.