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10CV661

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Theory of Elasticity

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain : i) Stress at a point ii) Strain at a point. **(10 Marks)**

b. Explain the assumptions made in theory of elasticity, and also its applications. **(10 Marks)**

2 a. Derive the differential equations of equilibrium in two dimensional Cartesian co-ordinates. **(10 Marks)**

b. What is an Airy's stress function? Explain its importance in the theory of elasticity. **(10 Marks)**

3 a. Define the following with sketches and suitable examples :
i) Plane stress problems ii) Plane strain problems. **(10 Marks)**

b. By means of a strain rosette, the following strains, were recorded during the test on a structural member. $\in_{\phi} = 2\times10^{-3}$, $\in_{(\alpha+\phi)} = 1.35\times10^{-3}$, $\in_{(\alpha+\beta+\phi)} = 0.95\times10^{-3}$.
Determine i) Magnitude of principal strains and ii) Orientation of principal planes.
Given that: $\phi = 0^0$, $\alpha = \beta = 45^0$, $\mu = 0.33$, $E = 210$ GPa. **(10 Marks)**

4 Find the expressions of stress for a bending of simply supported beam subjected to uniformly distributed loading. **(20 Marks)**

PART – B

5 a. Derive the partial differential equations of equilibrium in polar coordinates for 2 – dimensional system. **(10 Marks)**

b. Check if $\phi = -\frac{P}{\pi} r\theta \sin\theta$ represents a stress function. **(10 Marks)**

6 a. Define Axi-symmetric problem with example. **(06 Marks)**

b. Derive Lame's equation for thick cylinders. **(14 Marks)**

7 Discuss the effect of circular hole on stress distribution in plate subjected to uniform tensile stress 'P'. **(20 Marks)**

8 a. Derive the differential equation of torsion in the form $\nabla^2\phi = -2G\theta$. **(10 Marks)**

b. Prove that the angle of twist of an elliptical section with major axis '2a' and minor axis '2b' is given by $\theta = \frac{T(a^2+b^2)}{\pi a^3 b^3 G}$. **(10 Marks)**

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