

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech. Summer 2018 – 19 Examination

Semester: 1**Subject Code: 03209104****Subject Name: Theory of Elasticity****Date: 01/05/2019****Time: 10:30am To 01:00pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 A) State and justify the basic assumptions in theory of elasticity. **(05)**

B) Explain with neat sketches the macroscopic behavior of material. **(05)**

C) Explain the difference between plane stress and plane strain. **(05)**

Q.2 Answer the following questions. (Attempt any three) (Each five mark) **(15)**

A) Explain briefly Tresca's criteria with the help of equations.

B) Describe the need of theory of elasticity in structural engineering.

C) Formulate equilibrium equation for two dimensional differential elements.

D) Derive the equation for determination of principal stresses.

Q.3 A) Derive differential equation of equilibrium for small rectangular element. **(07)**

B) The displacement components in a strained body are

$$u = 0.01x + 0.002y^2$$

$$v = 0.02x^2 + 0.02z^3$$

$$w = 0.001x + 0.005$$

(08)

What is the change in the distance between two points which before deformation have coordinates (3, 2, 0) and (-1, 14, 5).

OR

B) What is Cauchy's stress principle? Explain with mathematical expression. **(08)**

A) The following are the principal stress at a point in a stressed material. Taking $E = 210 \text{ kN/mm}^2$

Q.4 and $\nu = 0.3$, calculate the volumetric strain and Lamé's constants. **(07)**

$$\sigma_x = 200 \text{ N/mm}^2, \sigma_y = 150 \text{ N/mm}^2 \text{ and } \sigma_z = 120 \text{ N/mm}^2$$

OR

A) State the advantages of using Airy's stress function. Also arrive at the Airy's stress function by derivation. **(07)**

B) Write a comprehensive note on stress concentration. **(08)**