Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech.Winter2018 – 19 Examination

Semester: 1 **Date: 12/12/2018**
Subject Code: 03209104 **Time: 10:30 am to 01:00 pm**
Subject Name: Theory of Elasticity **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)** Mention the significance and applications of theory of elasticity? (05)

B) Write a comprehensive note on stress concentration. (05)

C) What is Cauchy's stress principle? Explain with mathematical expression. (05)

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

A)Write a short note on macroscopic behaviour of material

B) State and justify the basic assumptions in theory of elasticity.

C) The following are the principal stress at a point in a stressed material. Taking $E=210kN/mm^2$ and $\nu=0.3$, calculate the volumetric strain and the Lame's constants.

$\sigma_x=200N/mm^2$, $\sigma_y=150N/mm^2$, $\sigma_z=120N/mm^2$

D) Write a short note on following. (Mention the statement and Equation)

i. Tresca's critera

ii. Von Mises criteria.

Q.3 **A)** Is the following state of strain possible? (07)

$e_x= A(x^2+y^2)$ $\gamma_{xy}= 2Axy$
$e_z= \gamma_{xz}= \gamma_{yz}=0$ $e_y= Ay^2$

B) The stress components at a point in a body are given by
$\sigma_x=3xy^2+2x$, $\sigma_y=5xyz+3y$, $\sigma_z=x^2y+y^2z$ $\tau_{xy} = 0$, $\tau_{yz} =\tau_{xz} =3xy^2+2xy$
Determine whether these components of stress satisfy the equilibrium equations or not as the point (1,-1, 2). If not then find body force at this point so that the stress components are under equilibrium. (08)

OR

B) The state of strain at a point is given by:
$\varepsilon x=0.001$, $\varepsilon y=-0.003$, $\varepsilon z= \gamma_{xy}=0$, $\gamma_{xz}= -0.004$, $\gamma_{yz}=0.001$
Determine the stress tensor at this point. Take $E = 210\times10^6 kN/m^2$, Poisson's ratio = 0.28. Also find Lame's constant. (08)

Q.4 **A)** Derive the relationship between plane stress and plane strain for plane stress case. (07)

OR

A) Derive the strain-strain relationship equation (Generalized Hooke's law) for linearly isotropic material. (07)

B) Derive expression for two dimensional stress at a point. Also, Derive expression for principle stress and principle plane for two dimensional stresses. (08)