

Bansilal Ramnath Agarwal Charitable Trust's
Vishwakarma Institute of Information Technology, Pune
Department of Civil Engineering

Bloom's Taxonomy Level *paper code: P119-111 (T1)*

Name of the course: Theory of Elasticity (CVPB11181)

Examination: T1 (October 2019)

Question No	Bloom's Taxonomy Level
Q1	Creation
Q2a	Applying
Q2b	Analysis
Q3a	Analysis
Q3b	Applying
Q4	Creation

Course Teacher

F.Y. M. Tech. (Structural Engineering)

Q1) $\frac{\partial \sigma_{xx}}{\partial x} + \frac{\partial \tau_{yx}}{\partial y} + \frac{\partial \tau_{zx}}{\partial z} + X = 0$ — Correct derivation - 3 marks

$\frac{\partial \tau_{xy}}{\partial x} + \frac{\partial \sigma_{yy}}{\partial y} + \frac{\partial \tau_{zy}}{\partial z} + Y = 0$ — Correct derivation - 3 marks

$\frac{\partial \tau_{xz}}{\partial x} + \frac{\partial \tau_{yz}}{\partial z} + \frac{\partial \sigma_{zz}}{\partial z} + Z = 0$ — Correct derivation - 3 marks

Sketch of three dimensional element - 1 mark
OR

Q2a) $\{\epsilon\} = \begin{Bmatrix} 4x \\ -1 \\ 0 \\ 2y \\ 5+2y \\ 3 \end{Bmatrix} = \begin{Bmatrix} 12 \\ -1 \\ 0 \\ 2 \\ 7 \\ 3 \end{Bmatrix}$ — 2 marks for getting correct values of strain component
— 1 mark for correct formula.

Q2b) The stress components do not satisfy equilibrium equations.

$F_x = -11 \text{ kN}$ $F_y = -16 \text{ kN}$ & $F_z = 5 \text{ kN}$
— 3 marks for stress equilibrium equations & 3 marks for body forces

Q3a) No, the strain components do not satisfy compatibility equations.

Writing correct equation - 1 mark

Solving the equations & final answer - 3 marks.

Q3b) $E_v = 8.954 \times 10^{-3}$ $\lambda = 121.14 \times 10^3 \text{ N/mm}^2$

— 3 marks each.

OR.

Q4) $\nabla^2 (\sigma_x + \sigma_y) = 0$ — ~~2 marks~~

Strain compatibility equation - 2 marks

Stress equilibrium equations - 2 marks

Substitution & final answer - 6 marks.