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Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

M.Tech. (First Semester – Regular/Supplementary) Examinations, January – 2026

24MSEPC11001 – Theory of Elasticity and Plasticity
(STRUCTURAL ENGINEERING)

Time: 2 hrs | Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Explain strain tensor.	CO2	K2
b. Discuss Lami's constants.	CO3	K2
c. Express the stress compatibility equation for plane stress and plane strain case	CO1	K2
d. Define the complimentary stress.	CO4	K2
e. Define the torsional rigidity.	CO5	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Explain about the reduction of elastic constants for homogeneous and isotropic materials	5	CO1	K2
b. Develop the elastic stress strain relationship by understanding of Hooke's law for isotropic and homogeneous materials.	5	CO1	K3
(OR)			
c. Compose the compatibility equation in 3-D Cartesian co-ordinates	5	CO2	K2
d. Derive the stress distribution in an elliptical cross section	5	CO2	K3
3.a. Compare the yield criteria of Tresca and Von Mises.	5	CO3	K2
b. Derive an equation for shear stress for an elliptical bar subjected to torsional moment M.	5	CO3	K3
(OR)			
c. Explain in detail the various theories of plasticity failure, highlighting their assumptions and limitations.	10	CO3	K2
4.a. Derive the stress distribution in a thick cylinder by using elasticity	5	CO3	K2
b. Draw three dimensional bodies showing all components of stress	5	CO1	K3
(OR)			
c. Derive the compatibility equation in terms of stress for three dimensional elastic body.	5	CO2	K2
d. Using suitable case studies, justify the applicability of any two failure theories.	5	CO2	K3
5.a. Using Fourier Integral method, determine the solution of biharmoic equation in Cartesian Coordinates	5	CO4	K2
b. Describe a boundary value problem with appropriate examples.	5	CO4	K3
(OR)			
c. Derive stress function in terms of x and y in absence of body force.	5	CO4	K2
d. Develop the differential equation of equilibrium in three dimension of a rectangular element	5	CO4	K2
6.a. Illustrate short notes on:	10	CO5	K3

i. Maximum Principal Stress Theory
ii. Maximum Principal Strain Theory

(OR)

b.	Find the expression for the normal and shear for a circular disc subjected to compression along the diameter	5	CO5	K2
c.	Discuss elastic–plastic problems in bending and torsion with reference to an idealized stress–strain relationship.	5	CO5	K3

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