

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS- 2026

M.Tech-II Semester (SE)

COURSE CODE (CREDITS): 25M11CE211[3]

MAX MARKS: 25

COURSE NAME: Solid Mechanics in Structural Engineering

COURSE INSTRUCTOR: Dr. Tanmay Gupta

MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory. (b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problem. (c) Use of calculator is allowed

Q.No	Question	CO	Marks
Q1	(a) Similar to stress, we define "Principal Strains." Does a plane of principal strain always coincide with a plane of principal stress? Explain why or why not. (b) Explain the Physical Interpretation of Normal and Shear Strain?	1	3
Q2	Explain the physical meaning of Elastic Constants E (young's modulus), K (bulk modulus), ν (poisson's ratio). Write the relationship between these three, using lame's constant and prove it.	4	4
Q3	What is the fundamental purpose of a Failure Theory? Why can't we simply use the Yield Strength from a tensile test? Describe the Maximum Principal Stress Theory (Rankine's Theory) and Maximum Shear stress theory and its limitations.	5	5
Q4	For the following plane strain distribution, verify whether the compatibility condition is satisfied. $\epsilon_{xx} = 3x^2y$, $\epsilon_{yy} = 4y^2x + 10^{-2}$, $\gamma_{xy} = 2xy + 2x^3$	2	4
Q5	The displacement field for a body is given by $u = [(x^2 + y^2 + 2)i + (3x + 4y^2)j + (2x^3 + 4z)k]10^{-4}$ What is the displaced position of a point originally at (1, 2, 3)?	3	4
Q6	For steel, the following data is applicable: $E = 207 \times 10^6$ kPa, and $G = 80 \times 10^6$ kPa For the given strain matrix at a point, determine the stress matrix. $[\epsilon_{ij}] = \begin{bmatrix} 0.001 & 0 & -0.002 \\ 0 & -0.003 & 0.003 \\ -0.002 & 0.003 & 0 \end{bmatrix}$	4	5