JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

M.Tech-II Semester (SE)

COURSE CODE (CREDITS): 11M1WCE214 (3) MAX. MARKS: 35

COURSE NAME: THEORY OF PLATES AND SHELLS

COURSE INSTRUCTORS: DR. SAURAV MAX. TIME: 2 Hours

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	CO	Marks
Q1	A thin rectangular plate of dimensions 1 m × 1.5 m and thickness 10 mm is simply supported on all four edges and subjected to a uniform transverse load of 500 N/m². Calculate the maximum deflection at the center of the plate using classical plate theory. Assume $E=2.1\times10^{11}$ Pa and $\nu=0.3$	1	5
Q2.	Derive an equation to compute bending Moments M_x and M_y for a simply supported square plate subjected to sinusoidal loading. Determine the bending moments M_x and M_y for a square isotropic plate of side 2 m simply supported, thickness 12 mm, subjected to a sinusoidal load $q(x,y)=q_0\sin(\pi x/a)\sin(\pi y/a)$ where $q_0=1000N/m^2$. Use E=200GPa and $\nu=0.25$	1	5
Q3.	A circular plate of radius R=0.5m and thickness h=0.015m is clamped at the edge and subjected to a uniform pressure $q=1000N/m^2$. The plate material has E=210GPa and $\nu=0.3$. Calculate the maximum deflection at the center of the plate using the formula for a clamped circular plate under uniform pressure.	4	5
Q4.	Stating assumption Derive the governing differential equation for the bending behavior of a thin, isotropic, and homogeneous circular plate under axisymmetric loading using classical plate theory. Express the bending moments using polar coordinates. Apply equilibrium conditions in the radial direction for axisymmetric loading.	4	7

	Derive the final form of the differential equation in terms of transverse deflection w(r).		
Q5.	Calculate the increase in volume of a spherical shell 1m in diameter and 1 cm thick when it is subjected to an internal pressure of 1.6 MN/m^2. Take E = 200 GN/m^2, and v = 0.3	4	5
Q6.	Using Mohr's circle representation, determine the following for a plate under pure bending: • The principal curvatures. • The orientation of the principal planes. • The angle at which the maximum twist (maximum torsional curvature) occurs.	2	5
Q7	The deflection w of an isotropic rectangular plate is given by the expression: $w(x,y)= 4x^3-2y^3$ The thickness of the plate is 10 mm, Young's modulus is E=200kN/mm^2, and Poisson's ratio is v=0.25. Determine the bending moments Mx, My, and M_{xy} at the point (x,y) = (1.5,0.5).	3	3