JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

Term 2 EXAMINATIONS–2023

M.Tech.–II Semester (Structural Engineering)

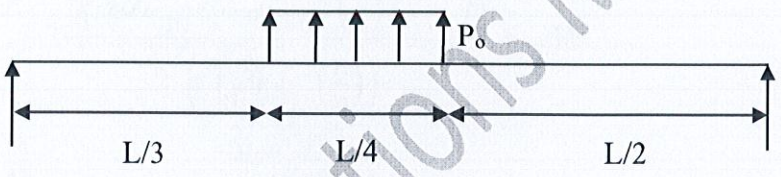
COURSE CODE (CREDITS): 12M1WCE214 (3) MAX. MARKS: 25

COURSE NAME: Theory of Plates and Shells

COURSE INSTRUCTORS: Sugandha Singh MAX. TIME: 1 Hour 30 Min

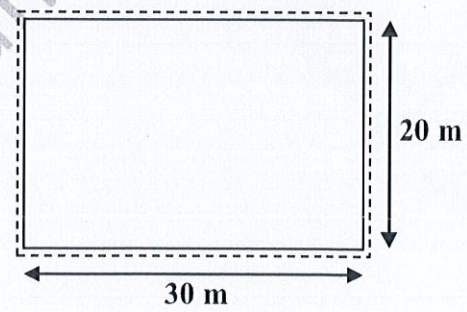
Note: *All questions are compulsory. Marks are indicated against each question in square brackets.*

1. Derive the Fourier series function for the following load on a thin plate undergoing cylindrical bending. **[5]**



2. For the thin plate (t=12 mm) shown below, subjected to sinusoidal load of amplitude, P_0=100 KN/m^2 and simply supported at all ends, find the following:

E=2 X 10^5 N/mm^2



a. Equation for deflection of middle surface. Point and value of maximum deflection of the middle surface. **[3]**

b. Maximum displacement in y direction. **[2]**

c. Maximum strain in y direction. **[2]**

d. Maximum stress in y direction. **[2]**

e. Maximum moment, M_{yy}. **[1]**

3. Show that the total of Kirchoff Shear on all edges of simply supported thin plate undergoing bidirectional bending is as follows: **[10]**

$$V = \frac{4}{\pi^2} p_0 ab + \frac{8p_0(1-\nu)}{\pi^2 ab\left(\frac{1}{a^2}+\frac{1}{b^2}\right)}$$

Assume that Q_x, Q_y, and M_{xy} are as follows:

$$Q_x = \frac{\frac{\pi}{a} p_0 \cos\frac{\pi x}{a} \sin\frac{\pi y}{b}}{\left(\frac{\pi}{a}\right)^2 + \left(\frac{\pi}{b}\right)^2}$$

$$Q_y = \frac{\frac{\pi}{b} p_0 \sin\frac{\pi x}{a} \cos\frac{\pi y}{b}}{\left(\frac{\pi}{a}\right)^2 + \left(\frac{\pi}{b}\right)^2}$$

$$M_{xy} = \frac{(\nu-1)\left(\frac{\pi}{a}\right)\left(\frac{\pi}{b}\right) p_0 \cos\frac{\pi x}{a} \cos\frac{\pi y}{b}}{\left(\left(\frac{\pi}{a}\right)^2 + \left(\frac{\pi}{b}\right)^2\right)^2}$$