

**B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEM. EXAM. -2024****Subject: THEORY OF STRUCTURES IV (HONS.) Time: 3 hours****Full Marks 100**

No. of questions	<u>Answer all questions</u>	Marks 20+15x2+ 22x2+6=100
1.	<p>Show that the maximum deflection at the center of a simply supported rectangular plate subjected to a single concentrated load 'P' at center point is</p> $w_{max} = \frac{4P}{\pi^4 abD} \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} \frac{1}{\left(\frac{m^2}{a^2} + \frac{n^2}{b^2}\right)^2}$ <p>Use Navier Solution. 'a' is the length of plate and 'b' is the width of plate. D is the flexural rigidity. 'm' and 'n' are no. of terms.</p>	CO1 20
2.	<p>A simply supported rectangular plate subjected to sinusoidal loading distributed over the plate surface is given by the expression. <math>q = q_0 \sin \frac{\pi x}{a} \sin \frac{\pi y}{b}</math>. 'q<sub>0</sub>' is the intensity of loading at center of the plate. 'a' and 'b' are the length of and breath of the plate. Deduce the expressions for deflection (w) and moments M<sub>x</sub>, M<sub>y</sub>, M<sub>xy</sub></p>	CO1 15
3.	<p>Find the membrane forces in a cylindrical shell roof subjected to gravity load (self-weight) only.</p>	CO2 15

4.	<p>a. Derive the expression for stiffness matrix. Notations are self-explanatory</p> $[K] = \int B^T D B dv$ <p>b. Determine the shape function for a three-node bar element with natural coordinate</p>	CO3 14+8=22
5.	<p>a. Determine the shape function of 4 node rectangular element. Use natural coordinate system</p> <p>b. What do you mean by isoparametric, superparametric and submarametric element with neat sketch.</p>	CO3 14+8=22
6.	Write down the requirement of model analysis and write down the difference between direct and indirect method of model analysis	CO4 6