SEAT No. : ☐

P4187

[Total No. of Pages : 2

[4960]-45

M.E. (Civil / Structures)

THEORY OF PLATES AND SHELLS

(2008 Pattern)

Time : 4 Hour]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Attempt any two questions from each section.*

2) *Answers to the two sections should be written in separate books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full marks.*

5) *Use of non programmable electronic calculator is allowed.*

6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) For analysis of plates, state and explain various assumptions made in small deflection theory. **[5]**

b) Derive the governing differential equation in Cartesian coordinates for bending of rectangular thin plates. Discuss the boundary conditions.**[12]**

c) For isotropic plates, under the action of lateral loading determine the stress-strain relations and hence the moment curvature relations in Cartesian coordinate system. **[8]**

Q2) a) Derive Navier's solution for deflection a simply supported rectangular plate under uniform intensity of loading q. **[16]**

b) For a simply supported isotropic plate subjected to uniform intensity of loading q, apply Ritz's method to obtain the expression for deflected shape of the plate. **[9]**

Q3) Develop from first principles, governing differential equation for circular plate under axisymmetric loading. Also obtain the expressions for radial moment at the center of clamped plate. **[25]**

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SECTION - II

Q4) a) Derive the expressions for the strains in the shell at a point due to membrane actions. **[18]**

b) Classify thin shell into various types of based on shell geometry and curvature. **[7]**

Q5) a) Derive equilibrium equation and hence equation for deflection using general cylindrical shell theory(considering bending action) for axisymmetric load. **[20]**

b) State the advantages of the shell structure as compared to plates. **[5]**

Q6) a) Explain the need for the bending theory for the analysis of the shell structure. **[5]**

b) Describe in brief, the Lundgren's beam theory for thin shells. **[5]**

c) For a cantilever cylindrical open shell of length L, radius a, and half angle φ_o subjected to self weight , obtain the expression membrane stresses N_x, N_φ, and $N_{x\varphi}$. **[15]**

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