

M.E. Second Semester (Civil (Structural Engg.)) (New - CGS)
13093 : Theory of Plates and Shells : 2 SFES 3

P. Pages : 2

Time : Three Hours



AU - 3451

Max. Marks : 80

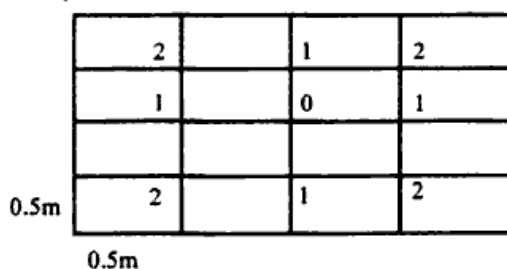
- Notes : 1. Answer **three** question from Section A and **three** question from Section B.
2. Assume suitable data wherever necessary.
3. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. Derive Lagrange's equation for small deflections of Laterally loaded rectangular plates. Explain different boundary conditions. **13**
2. Derive the general equation for deflection of simply supported rectangular plate subjected to sinusoidal loading. **14**

$$q = q_0 \sin \frac{\pi x}{a} \sin \frac{\pi y}{b}$$

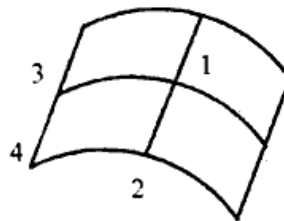
where q_0 = intensity of loading 'a' and 'b' are the sizes of plate. Derive expressions for m_x and m_y also.
3. Derive the governing differential equation for anisotropic plate using first principle. **13**
4. A circular plate of radius 'a' is subjected to symmetrical bending due to uniform load of intensity 'q' on each unit area. If flexural stiffness 'D', derive governing differential equation of a plate. **13**
5. A square plate of size 2m x 2m having thickness 10mm is simply supported along the edges and carries a udl of 1.2kN/m² on the entire surface of the plate. Calculate deflections and B_M at points 0, 1 and 2 Take $\mu = 0.3$ and $E = 2 \times 10^8 \text{ kN/m}^2$. **13**



SECTION - B

6. a) Classify the shell surfaces with one suitable example for each classification. **6**
 b) Derive the equations for following shell surfaces. **8**
 i) Cycloid. ii) Catenary.
7. Using membrane theory of circular shells with circular directrix obtain an expression for stress under. **13**
 i) Dead load. ii) Show load.

8. Derive Schorer's differential equation in bending theory of cylindrical shell. 13
9. a) State assumptions made in bending theory of cylindrical shells. 6
- b) State assumptions, advantages and range of validity of Beam theory of cylindrical shells. 7
10. Using membrane theory, find the values of stress resultants N_θ , $N_{x\theta}$ and N_x due to Dead load and show load in cylindrical shell having circular directrix at point 1,2,3 and 4 as shown in fig. 13
- Radius of shell = 10m
Span = 25m
Semi central angle = 40° .
DL = 2 kN/m^2 .
SL = 1 kN/m^2 .



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