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M.E. Second Semester (Civil (Structural Engineering)) (New-CGS)

13093 : Theory of Plates and Shells

2 SFES 3

P. Pages : 1 | **AW - 3891**

Time : Three Hours | Max. Marks : 80

Notes : 1. Answer **Three** question from Section A and **Three** question from Section B.
2. Assume suitable data wherever necessary.
3. Illustrate your answer necessary with the help of neat sketches.
4. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION – A

1. a) State assumptions made in theory of thin plates with small deflection. **4**

b) Derive from first principle moment-curvature relationship for plates in pure bending. **10**

2. Derive Lagrange's equation for small deflection of Laterally loaded rectangular plate. Explain different boundary conditions. **13**

3. Derive an expression for maximum deflection of simply supported rectangular plate carrying load $q = f(x, y)$ using Navier's solution. **13**

4. Find the finite difference operator for a deflection of plate, bending moment and twisting moment for a simply supported edges. **13**

5. Derive the governing differential equation for anisotropic plate using first principle. **13**

SECTION – B

6. a) State assumptions made in membrane theory. **6**

b) Derive general equilibrium equations in case of membrane theory for a shell with usual notation $N_X, N_\theta, N_{X\theta}$ and R. **7**

7. Using membrane theory of circular shells with circular directrix obtain an expression for stress under **13**

1) Dead load. 2) Snow load.

8. 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**

9. Find the values of N_X and $N_{X\phi}$ in shell element of cylindrical shell with edge beam for following details. **14**

L = 38 m
$\phi_C = 38°$
d = 0.1 m
B = 0.2 m
D = 0.6 m
DL = 3.2kN/m^2
SL = 2kN/m^2
Radius a = 10 m

10. Derive Schorer's differential equation in bending theory of cylindrical shell. **13**

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