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

13093 : Theory of Plates and Shells : 2 SFES 3

P. Pages : 2 | AW - 3620

Time : Three Hours | Max. Marks : 80

Notes : 1. Answer **three** question from section "A" and **three** question from section "B".
2. Illustrate your answer necessary with the help of neat sketches.
3. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION – A

1. a) Write down a assumption in theory of thin plate with small deflection. **4**

b) Derive the relation between bending moment and curvature of plate. Also find twisting moment in term of curvature. **10**

2. A simply supported rectangular plate of side 2m x 1m, 10mm thick is subjected to a UDL of 2 kN/m^2. Find the deflection at point 'P' of the plate using 'Navier's Solution' **13**

$E = 2x10^5$ kN / m^2, V = 0.3, Also find max deflection.

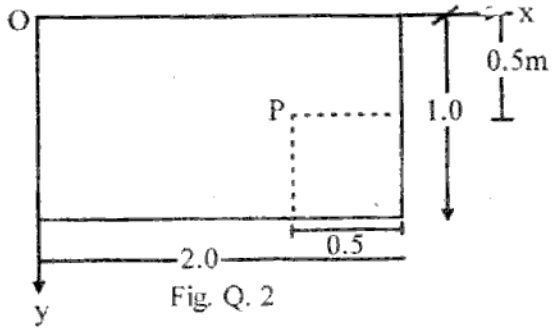

Fig. Q. 2

3. a) Derive expression for deflection surface 'w' bending moment Mr and Mt for a clamped circular plate subjected to UDL over the entire surface of the plate. **9**

b) A circular plate of radius 70 cm and thickness 10 mm is subjected to UDL of 1.0 kN/m^2 on the entire surface of plate. **4**

Calculate

i) Max – deflection
ii) Radial and circumferential moment at centre and at edge.
iii) Max stress developed in plate

Take $E = 2x10^5$ N / mm^2 & U = 0.3

4. A rectangular plate (a × b) is subjected to a load given by **13**

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

find the deflection maximum in terms of UDL 'q_0' flexural rigidity and plate dimension using governing differential equation.

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

SECTION – B

6. a) Classify the shell surface. Give one example of each classification. **6**

   b) Derive the equation of following shell surface **8**
   i) Semi ellipse
   ii) Parabolic.

7. State the assumption made in Finster Walder Theory of cylindrical shell subjected to bending. Derive the 8^{th} order differential equation for Finster Walder Theory. **13**

8. Using beam theory of cylindrical shell find the max value of the stress resultant Nx and $Nx\phi$ in cylindrical shell from the following data. **13**
   i) Span – 30 m
   ii) Thickness of shell – 10 cm
   iii) Semi - central angle – 38°
   iv) Radius – 10 m
   v) Dead Load – 3 kN/m^2
   vi) Show Load – 1 kN/m^2

   Draw net sketch showing the variation of stress resultant across the cross section of the shell.

9. Derive an expression by using Schorer's theory of bending of cylindrical shell. **13**

10. Write down step wise design procedure for a circular cylindrical shell using membrane theory. **13**

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