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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Second Semester, M. Tech - Civil Engineering (MCAD)

Make-up Examination; July - 2016

Analysis of Plates

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Assume missing data if any.

UNIT - I

1 a. Show that the sum of curvatures in any two mutually perpendicular directions is independent of the chosen coordinate axes. 10

b. Derive from fundamentals the equation for deflection of a long rectangular plate under UDL, bending over short span. Hence find the deflection of a long plate with h = 125 mm, $\mu = 0.12$, $q = 5$ kN/m^2, span = 1 m and E = 0.2x10^6 MPa. The length of the plate is much longer than its span. 10

2. Derive an equation $\frac{d}{dr}\left\{\frac{1}{r}\frac{d}{dr}\left(\frac{rdw}{dr}\right)\right\}=\frac{Q}{D}$ with usual notations for a solid circular plate in bending. Hence forth derive an expression for deflection, and subjected to a uniformly distributed load of intensity '*q*' per unit area. 20

UNIT - II

3 a. Derive the differential equation of the deflected surface of a plate in the form of,

$\nabla^4 w = \frac{q}{D}$. 10

b. Determine the maximum deflection of a simply supported rectangular plate under sinusoidal load $q = q_0 \sin\frac{\pi x}{a}\sin\frac{\pi y}{b}$. 10

4. Using Navier's solution obtain the expression for maximum deflection and bending moments for an all round simply supported rectangular plate subjected to UDL '*q*' per unit area. 20

UNIT - III

5. Using levy's solution, obtain the expression for maximum deflection in case of simply supported rectangular plate is subjected to $\omega = \sum_{m=1}^{\infty} y_n \sin\frac{m\pi x}{a}$. 20

6. Find the deflection of rectangular plate a x b subjected to symmetric moments distributed along the edges $y = \pm\frac{b}{2}$. 20

Contd…2

UNIT - IV

7. Derive the approximate formula for uniformly loaded circular plates with large deflections. 20

8. Obtain the exact solution for large deflections of a circular plate with clamped edge subjected to uniformly distributed load. 20

UNIT - V

9. Using finite difference technique analyse the bending of a square plate of size a x a with simply supported edges subjected to UDL of intensity 'q' per unit area. Use mesh size $h = \frac{a}{4}$. 20

10. Determine the deflection and moment at various points of a plate clamped along the edges of size a x a subjected to UDL of intensity q_0 per unit area. Use mesh size $\frac{a}{4}$. 20

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