



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

(An Autonomous Institution affiliated to VTU, Belgaum)

Third Semester, M. Tech. - Mechanical Engineering (MMDN)

Semester End Examination; Dec - 2016/Jan - 2017

Theory of Plates and Shells

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

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| 1 a. | Derive the differential equation for cylindrical bending of plates. | 8 |
| | b. Obtain the governing differential equations for small deflections of laterally loaded plates. | 12 |
| 2 a. | State the assumptions made in the analysis of thin plates with small deflection. | 6 |
| | b. Derive an expression for deflection in cylindrical bending of uniformly loaded rectangular plate with simply supported edges. | 14 |

UNIT - II

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| 3 a. | Show that the sum of curvatures in any two mutually perpendicular directions is constant for pure bending of plates. | 10 |
| | b. Develop the relationship between moment and curvature in pure bending of plates. | 10 |
| 4 a. | A rectangular sheet metal of 5 mm thickness is bent into a circular cylinder having a radius 'r'. Calculate the diameter of the cylinder and moment developed in the metal, if the allowable stress not to exceed 96 MPa. Given $E = 70 \text{ GPa}$ and $\nu = 0.3$. | 8 |
| | b. A circular plate with clamped edge of radius 'a' carries a load of intensity 'q' uniformly distributed over the entire surface of the plate. Develop the expression for bending moments M_r and M_t . | 12 |

UNIT - III

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| 5. | Obtain an expression for maximum deflection of simply supported rectangular plates using Levy's method. | 20 |
| 6. | Obtain an expression for deflection of simply supported rectangular plate by using Navier's method. Find maximum deflection for uniformly distributed load P_0 . | 20 |

UNIT - IV

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| 7 a. | State the assumptions made in the analysis of thin shells. Explain briefly the classifications of shells. | 10 |
| | b. Distinguish between plate and shells. Mention their advantages and disadvantages. | 10 |

8. Establish the equations required for a circular cylindrical shells loaded symmetrically with respect to its axis. Then deduce it to the long cylinder submitted to the action of bending moments M_0 and shearing forces Q_0 at the ends. Also find the maximum deflection. 20

UNIT - V

- 9 a. Obtain the expression for forces N_x , $N_{\theta x}$ and N_θ for a cylindrical shell of general shape subjected to asymmetrical loading. 10
- b. Explain DKJ theory and write its eight order differential equation. 10
10. Write short notes on the following :
- i) Behaviour of folded plates
 - ii) Kirchhoff's shear 20
 - iii) Edge beam theory-cylindrical shells
 - iv) Conical shells and long cylindrical shells.

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