

ME Civil Engg. First Year First Semester Examination,2018

SUBJECT – Theory of Plates and Shells

Full Marks 100

Time: Three hours

Answer any 4 questions

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- 1 A diaphragm supported concrete cylindrical shell is 22 m long along beam direction and 8 m long along arch direction. It has a thickness of 75 mm and rise of the crown is 1.5m. Deduce the equations of N_x , N_θ and $N_{x\theta}$ of this shell under its own dead weight. Plot the variations of these force components along the beam direction along an edge beam. 25
 - 2 Draw and define the following the following shell categories – anticlastic and synclastic , singly and doubly ruled , surfaces of translation and revolution , developable and non- developable surfaces , deep and shallow surfaces . 25
 - 3 Consider a hemispherical dome of radius of curvature R . Use membrane theory to deduce the expressions of radial and meridional normal forces and the inplane shear force . Deduce the limiting latitude where the dome may develop tension under self weight. 25
 - 4 Derive the moment – curvature relationships connecting the bending and twisting moments of a thin plate to its curvatures. You may assume the strain-displacement relationships obtained from general theory of elasticity. 25
 - 5 Derive the basic equation of plate bending for a thin plate subjected to uniformly distributed load all over its surface. 25
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