Ref.No : EX/PG/CE/T/ 116A/2024

ME Civil Engg. First Year, First Semester Examination,2024

SUBJECT – Theory of Plates and Shells

Part I

Full Marks 60 Time: Three hours

Answer any 2 questions

1	A diaphragm supported concrete cylindrical shell is 20 m long along beam direction and 10 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 .	30
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 .	30
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.	30

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M.E. CIVIL ENGINEERING
FIRST YEAR FIRST SEMESTER EXAM 2024

Theory of Plates and Shells

Part II (40 marks)

Attempt any TWO questions. Each question carries 20 marks.

1. How do we transform the on-axis stresses to off-axis stresses for any lamina of a laminated plate? Deduce the ρ matrix required to derive the mass matrix for a laminated plate finite element. [10+10]

2. Why must we account the transverse shear deformation for even a thin laminated composite plate? Deduce the A-B-B-D matrix for a laminated composite plate element following FSDT. [2+18]

3. Explain YNS plate theory. Deduce the **[B] matrix** of an isoparametric laminated composite plate element following YNS theory. [2+18]