

M. Civil Engg. 1<sup>st</sup> Sem Examination, 2017

Theory of Plates and Shells

Time 3 hours

Full marks 100

Use separate answer scripts for each part.

Part I (40 marks)

Attempt **question 1** and **any one** from the rest.

1. Deduce the governing equation for plate buckling. Comment on the buckling behaviour of a simply supported plate subjected to axial compression along one axis.

15+10 = 25

2. Find the Navier's solution for deflection of a rectangular plate simply supported at all edges for general loading.

15

3. Why Levy's solution for Kirchhoff's plate is better than Navier's solutions? Find the Levy's solution for a rectangular plate.

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M. Civil Engineering, 1<sup>st</sup> Semester , 2017  
SUBJECT – Theory of Plates and Shells

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PART II (60 marks)

**ANSWER ALL QUESTIONS**

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- 1 A diaphragm supported cylindrical shell is 10 m long along beam direction and 6 m long along arch direction. It has a thickness of 75mm and rise of the crown is 1.2m. Deduce the equations of  $N_x$ ,  $N_\theta$  and  $N_{x\theta}$  of this shell subjected to a dead load of 2.5 KN/sq.m . Plot the variations of these force components along the beam direction through the crown . 25
- 2a Draw the following shell forms and explain which category they belong to from different angles of classification – conoidal shells , elliptic paraboloidal shells , conical shells , hyper shells . 10
- 2b 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