INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
M.Tech I Semester End Examinations (Regular) - January, 2019
Regulation: IARE–R18
THEORY OF THIN PLATES AND SHELLS
Time: 3 Hours   **(STE)**   **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Write short notes on **[7M]**
   i) Ruled surface
   ii) Shells of translation
   iii) Shells of revolution with sketches

   (b) Derive the strain and strain - displacement relations for small displacements **[7M]**

2. (a) Define the term membrane and write short notes on membrane theory. **[7M]**

   (b) Elucidate the boundary conditions in rectangular and circular plates for the following support conditions **[7M]**
   i) Built-in edge
   ii) simply supported edge
   iii) free edge

UNIT – II

3. (a) Conclude an expression for the deflection under a sinusoidal loading on rectangular plates with edges simply supported with sides a and b using Navier's approach. **[7M]**

   (b) Using the Navier solution obtain general equation for a concentrated load on a simply supported rectangular plate. **[7M]**

4. (a) Express the equilibrium equations in polar coordinates of a circular plate. **[4M]**

   (b) Find out maximum deflection using Levi's solution for rectangular plate with one pair of edges is simply supported and other pair is fixed and subjected to uniformly distributed load of intensity q. **[10M]**

UNIT – III

5. (a) Write a short notes on an elastic foundation. **[4M]**

   (b) A thin simply supported plate of circular cross section with clamped edges is subjected to uniformly distributed load of intensity 'p' per unit area over its entire surface Assuming the deflection of the plate to be small in comparison to thickness determine from the fundamentals the maximum deflection and maximum bending moment in the plate **[10M]**

6. (a) Give the differential relations of the conditions of compatibility. **[4M]**

   (b) Obtain the expression for deflection in case of uniformly loaded rectangular plate with clamped edges by Rayleigh-Ritz method. **[10M]**

UNIT – IV

7. (a) Write the structural components of cylindrical shells with neat sketch mention the various loads acting on the shell. **[7M]**

   (b) Write the assumptions made in membrane theory of shells **[7M]**

8. (a) Elucidate the different classification of shells with neat sketches. **[7M]**

   (b) Differentiate between long shells and short shells. **[7M]**

UNIT – V

9. (a) Conclude the membrane equations of equilibrium for shells of revolution. **[7M]**

   (b) Elucidate stress resultants for spherical shells subjected to symmetrical loading. **[7M]**

10. (a) Explain the general case of deformation of a cylindrical cell. **[7M]**

    (b) Discuss the pressure vessels in cylindrical cells. **[7M]**

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