

B.E. Mechanical Engineering (MODEL CURRICULUM) Semester-VII  
**PEC-MEL-421 - Stress Analysis**

P. Pages : 2

Time : Three Hours



**GUG/W/22/14264**

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data wherever necessary.
  4. Diagrams and Chemical equation should be given wherever necessary.
  5. Illustrate your answers wherever necessary with the help of neat sketches.
  6. Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.

1. a) State and explain Saint Venant's principle. 5  
b) Derive compatibility equation for plane stress condition in the absence of Body forces. 15

**OR**

2. a) Explain plane stress and plane strain condition with suitable examples. 3  
b) Assuming a suitable stress function derive the expression for stresses in cantilever beam subjected to concentrated load at its free end. 17
3. a) Explain the effect of circular hole on stresses in case of plate subjected to tensile load. 5  
b) Explain the concept of symmetric stress distribution with suitable examples. 5  
c) Derive the equations for stresses in the circular cylinder subjected to internal external pressure. Assume inner radius and outer radius of cylinder as 'a' and 'b' respectively. 10

**OR**

4. Derive the expression for stresses in case of curved beam subjected to couples at its ends using the approach of stress function. 20
5. a) Define isoclinics and isochromatics fringes and how they develop in plane polariscope setup. 4  
b) State the various materials used for making Photoelastic models? Explain various properties that material should possess. 6  
c) Which are the various separation methods? Explain any one of them. 10

**OR**

6. a) Explain stress optic law and derive the expression to get difference between principal stresses  $\sigma_1 - \sigma_2$ . 6  
b) State and explain the effect of stressed model in circular polariscope set up with necessary derivation. Explain how isochromatic are observed in circular polariscope setup. 14

7. a) Explain phenomenon of stress freezing in 3D Photoelasticity. 5
- b) Explain the gauge factor of strain gauge and derive the relation for it. 5
- c) Derive the equation for bridge output voltage of unbalanced wheatstone bridge. 10

**OR**

8. Write short notes on **any four** of the following. 20
- i) Stress Freezing
- ii) Fringe sharpening
- iii) High temperature strain gauges
- iv) Brittle coating method of stress analysis
- v) Slicing of photoelastic model.
- vi) Strain rosette.

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