

B.E. Mechanical Engineering (Model Curriculum) Semester - VII
PEC-MEL421 - Stress Analysis

P. Pages : 2

Time : Three Hours



GUG/S/23/14264

Max. Marks : 80

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- 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 the concept of Airy's Stress Function. 3
- b) Assuming a suitable stress function derive the expression for stresses in cantilever beam subjected to concentrated load at its free end. 17

OR

2. a) Explain plane stress and plane strain condition with suitable examples. 5
- b) Derive compatibility equation for plane stress condition in the presence of Body forces. 15
3. a) Explain the effect of circular hole on stresses in case of plate subjected to tensile load. 5
- b) Derive general equations of equilibrium in polar coordinate system. 15

OR

4. a) Derive the expression for stresses in a rotating circular disk having inner radius of 'a' and outer radius 'b'. The angular velocity of disk is 'w' and density of material of disk is 'ρ'. 15
- b) Explain the concept of symmetric stress distribution with suitable examples. 5
5. a) Explain the following terms. 6
- i) Plane polarized light.
 - ii) Circularly polarized light
 - iii) Elliptically polarized light
- 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

OR

6. a) Explain stress optic law and derive the expression to get difference between principal stresses $\sigma_1 - \sigma_2$. 6
- b) Why separation techniques are required in photoelasticity. 4
- c) Discuss Tardy's method of compensation in detail. 10

7. a) Derive the equation for gauge factor of strain gauges. **10**
- b) Explain Brittle coating method for stress and strain analysis. **10**

OR

8. Write short notes on **any four** of the following. **20**

- i) Reflection polariscope.
- ii) Brittle coating method of stress analysis.
- iii) Fringe multiplication technique.
- iv) Self temperature compensated gauges.
- v) Slicing of photoelastic model.
- vi) High temperature strain gauges.
