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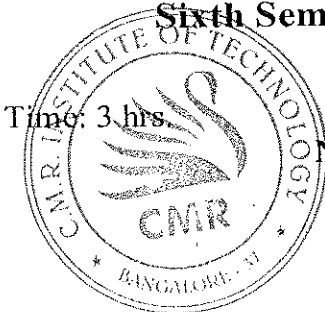
10CV661

Sixth Semester B.E. Degree Examination, June/July 2016

Theory of Elasticity

Time: 3 hrs.

Max. Marks: 100



- Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Assume any missing data suitably.

PART – A

- 1 a. Derive the expression for normal stress $\sigma_x = \tau e + 2G\epsilon_x$ and write the comparison equations in y and z directions. (10 Marks)
- b. Derive the differential equations of equilibrium for a 3 – dimensional system in Cartesian coordinate. (10 Marks)
- 2 a. At a point P in a 3 – D system the rectangular stress components are $\sigma_x = 1$; $\sigma_y = -2$; $\sigma_z = 4$; $\tau_{xy} = 2$; $\tau_{yz} = -3$ and $\tau_{xz} = 1$ all units are in KPa. Find the principal stresses and check for invariance. (10 Marks)
- b. The displacement field in micro units for a body is given by $u = (x^2 + y)i + (3 + 2)j + (x^2 + 2y)k$. determine the principal strains at (3, 1, -2) and the direction of the minimum principal strain. (10 Marks)
- 3 a. Write a note on strain Rosette. By means of strain rosette, the following strains were recorded during the test on a structural member.
 $\epsilon_{0^\circ} = -13 \times 10^{-6}$; $\epsilon_{45^\circ} = 7.5 \times 10^{-6}$; $\epsilon_{90^\circ} = 13 \times 10^{-6}$
determine : i) Magnitude of principal strains
ii) Orientation of principal planes. (10 Marks)
- b. Write a note on :
i) Plane stress problem
ii) Plane strain problem
iii) Mohr's circle. (10 Marks)
- 4 Find the expressions of stress for a bending of simply supported beam subjected to uniformly distributed loading. (20 Marks)

PART – B

- 5 a. Derive the partial differential equations of equilibrium in polar coordinates for 2-dimensional system. (10 Marks)
- b. Check if $\phi = -\frac{P}{\pi} r \theta \sin\theta$ represents a stress function. (10 Marks)
- 6 a. Define axisymmetric problem with example. (06 Marks)
- b. Derive Lamé's equation for thick cylinders. (14 Marks)
- 7 Discuss the effect of circular hole on the stress distribution of rectangular plate. (20 Marks)
- 8 a. Show that the stress function satisfy $\nabla^2 \phi = -2G\theta$ for torsion problems. (10 Marks)
- b. Write short notes on
i) St. Venant's principle (05 Marks)
ii) Airy's stress function. (05 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.