Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **M.TECH**

GEPE102,CEPC101

1st Semester Back Examination – 2016-17

THEORY OF ELASTICITY AND PLASTICITY

BRANCH: GE,SFE,SE

Time: 3 Hours

Max Marks: 70

Q.CODE:Y985

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

a) Define hydrostatic state of stress
b) What are stress invariants?
c) Check if the function $\phi = Ax^3y - Bx^2y^2$ is an Airy's stress function.
d) Give examples for plane strain problems.
e) Write the Brendt-Batho equation
f) With a neat sketch represent the shear stress flow in a thin 1-section under torsion.
g) Define Hook's law.
h) Show the stress-strain behavior of a material which is rigid with strain hardening properties
i) Discuss the stress concentration due to small hole in a strained plate with stress distribution diagram
j) Define Elasticity & Plasticity

Q2 a) Explain hooks law giving strain as a function of stress and also stresses in terms of strain in a plane stress case. (5)

b) Show that the change in volume of a strained cube of unit length is given by $\Delta e = \varepsilon_x + \varepsilon_y + \varepsilon_z$ (5)

Q3 a) Explain plane stress and plane strain state of stress. (5)

b) A thick cylinder is subjected to internal and external pressures define equations for radial and circumferential stresses at the boundaries (5)

Q4 Explain in brief the assumptions made in the derivations of stressed in a curved bar (10)

Q5 a) Derive an expression for the stress components in a solid bar of elliptical cross section subjected to twisting moment? (5)

b) A hollow thin walled brass tube has an equilateral triangle section the mean length of the side of the triangle is 125mm and thickness of the wall is 3mm the tube is subjected to a twisting moment of $2X10^4$ Nmm. Find the maximum shearing stress and the angle of twist per unit length. (5)

Q6 a) Estimate the torque on a 10 mm diameter steel shaft when yielding begins using (i) The tresca theory and (ii) The Von Mises theory. The yield strength of steel is 140 MPa. (5)

b) Derive an expression for Von Mises stress for the ductile materials (5)

Q7 a) A steel disc of uniform thickness and of diameter 900 mm is rotating about its axis at 3000 rpm. Determine the radial and circumferential stresses at the center and outer radius. The density of material is 7800 kg/m^2 and Poisson's ratio=0.3. (10)

Q8 Write short notes on any (5 x 2)

a) Coulomb yield criterion
b) Tresca's failure theory
c) Mohr's circle
d) Stress function
e) Finite difference method