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CODE NO:- Z-8005
FACULTY OF ENGINEERING & Technology
M.E (Structure) Year Examination-June-2015
Theory of Elasticity & plasticity
(Revised)

Time: Three Hours **Maximum Marks: 80**

"Please check whether you have got the right question paper."

i) Solve <u>any two</u> questions from each section.
ii) Assume suitable data if necessary and state clearly.

SECTION-A

Q.1 Derive Beltrami- Michel compatibility equation in terms of stress using saint-venant's compatibility equation and generalized law. 20

Q.2 For a contilever bean of cross section of depth 'h' and thickness 'b' loaded by vertical force 'p' at its free end. Show that Airy's stress function applicable is $\emptyset = \frac{2p}{bh^3}\ (xy^3 - \frac{3\,xy}{4}\ h^2)$ Where x & y are the co-ordinates having origin at the free end. EI is constant and G is the shear modulus find the stresses 6_x, 6_y, and z_{XY} and displacement v and u in x – y plane. Hence verify that plane section before bending does not remain plane after bending.

Q.3 Derive expression for 6_r and 6_Q stresses from elastic analysis of cylinder subjected to internal pressure P_1 and external pressure P_2, length of cylinder is L, internal radius r_1, external radius r_2. Hence obtain 6_r and 6_Q and u_{max}. 20

SECTION-B

Q.4 a) Define plasticity and yield criteria. 03
b) State assumptions of plasticity with brief explanation. 05
c) Explain the tresca yield criteria with their mises yield criteria with their geometrical representation in two dimension for yield surface. 12

Q.5 a) Explain the saint venant's theory of plastic flow. 5
b) Show the saint Venant's equations for plastic flow given the required number of equation to solve the problem of ideal plastic flow. 5
c) The plane state of stress at a point is given by $6_x = 70\ MP_a$, $6_y = 140MP_a$, $Z_{xy} = -35MP_a$. If the yield stress is $175MP_a$. Determine whether material will yield according to Tresca condition or Von-mises yield condition. 10

Q.6 a) Prove for the prismatic bar subject to the end twisting couples, the twisting moment is given by $M_t = 2\iint \emptyset\ d_x d_y$ where $\emptyset$= stress function 10
b) Find twisting moment, shears stresses, resultant shear stress and direction for a prismatic bar circular cross section subject to torsion 10