

FACULTY OF ENGINEERING & TECHNOLOGY

M.E (structural)Examination - DEC - 2014

Theory of Elasticity & Plasticity (Revised)

[Time: THREE Hours]

[Max. Marks: 80]

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

N.B

- 1) Solve any two question from section A&B each
 2) Assume suitable data, if required & state it clearly

SECTION A

- Q.1 A Derive expressions for shear strains in three dimensional state of stress. 10
 B Derive expressions for the strain e_{rr} in any direction $r(l,m,n)$ Within the small 3D element. 10
- Q.2 Derive the equation for the deviation principal stresses in terms of the general stress components σ_{ij} . Hence obtain the deviatoric J_1, J_2, J_3 and reduce them in terms of principal stress. 20
- Q.3 A Given the following stress function $\phi = \frac{H}{\pi} z \tan^{-1} \left(\frac{x}{z} \right)$, determine the stress components σ_x, σ_z and Zxz and check the equations and compatibility equation. 10
 B Investigate What problem of plane stress is satisfied by the stress function. 10
 $\phi = \frac{3F}{4d} \left(xz - \frac{xz^3}{3d^2} \right) + \frac{p}{2} z^2$ Applied to the region include in $z=0, z=d, x=0$ on the side x - positive. Show the variation of σ_x, σ_z and Zxz .

SECTION B

- Q.4 A Explain the phenomenon of work or strain hardening with the mathematical formulation and show how it is confirmed by the uniaxial yield test on a strain hardening material 10
 B Explain Tresca yield criteria giving the two dimensional representation. 10
- Q.5 A Discuss saint –venants laws of plastic flow and obtain the stress –strain relationship for the 3D plastic deformations 10
 B Explain the significance of the theories of failure of engineering materials. 10
- Q.6 A What are the assumptions made in the theory of plasticity? 05
 B Define the following terms in plasticity theory 10
 I) Yield criteria II) Stress-space
 III) π plane IV) yield surface & yield curve
- C Explain the saint venants theory of plastic flow. 05