Question Paper Code: 52613

M.E. DEGREE EXAMINATION, NOV 2016

First Semester

Structural Engineering

15PSE103 - THEORY OF ELASTICITY AND PLASTICITY

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 1 = 5 Marks)

1. Hook's law holds good up to

    (a) Yield point   (b) Elastic limit   (c) Plastic limit   (d) Breaking point

2. The solution of 2D problems may be obtained by introducing a function "ϕ" known as

    (a) Airy's stress function   (b) Potential function
    (c) Stress function   (d) None of these

3. Rayleigh Ritz method is based on the principle of

    (a) Law of conservation of energy   (b) Law of conservation of momentum
    (c) Both(a) and (b)   (d) None of these

4. The membrane analogy is used to find out

    (a) Analysis of loads   (b) Analysis of moments
    (c) Shear stress and torque   (d) None of these

5. Maximum principal stress theory is otherwise known as

    (a) Rankine's Theory   (b) Haigh's Theory
    (c) Tresca's Theory   (d) None of these

PART - B (5 x 3 = 15 Marks)

6. Define principal stress.

7. What are conjugate harmonic functions?

8. Give the poison's equation relating to torsion..

9. What is a dummy load method?

10. What are residual stresses in plastic bending?

PART - C (5 x 16 = 80 Marks)

11. (a) The stress field in a body is given by $\Sigma x=0.005z$; $\gamma xy=0.003xy$, $\Sigma y=0.001x$; $\gamma yz=-0.001xz$, $\Sigma z=-0.002xy$; $\gamma zx=0.001y$. Check whether it is a compatible strain field. (16)

Or

(b) The displacement field in a body is specified as: $Ux=(x^2+3) \times 10^{-3}$, $Uy=3y^2z \times 10^{-3}$, $Uz=(x+3z) \times 10^{-3}$. Determine the strain components at appoint whose coordinates are (1, 2, 3). (16)

12. (a) Derive the deflection equation for the bending of a cantilever loaded at the end in terms of Cartesian coordinates. (16)

Or

(b) Show that the stress function: $\phi = A \log r + Br^2 \log r + Cr^2 + D$, Solves the problems of axis symmetric stress distribution, obtain expressions for σr and $\sigma\theta$ in the case of a pipe subjected to internal pressure P_i and external pressure P_o. (16)

13. (a) Derive the torque equation of a prismatic bar subjected to thrust T, according to St.Venant's theory. (16)

Or

(b) Determine the deflection of simply supported beam carrying an udl of intensity 'q' using Rayleigh Ritz method. (16)

14. (a) Derive the expression for deflection of a rectangular plate by the principle of virtual work. (16)

Or

(b) Derive the expression for the rotation at A of a simply supported beam AB with udl over the entire span. (16)

15. (a) Discuss in detail the various theories of failure normally adopted to find the yield criteria. (16)

Or

(b) Briefly explain and compare the stress strain relationship for all the different 7 materials with graph and neat diagrams. (16)

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