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Question Paper Code: 92016

M.E. DEGREE EXAMINATION, MAY 2014.

Elective

CAD / CAM

01PCD523 - MECHANICAL BEHAVIOUR OF MATERIALS

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Define Principle stress.
2. Prove that $\sum S_{ii} = 0$
3. Under what conditions Levy Mises equations can be used?
4. Under what situations True stress - strain diagram is used?
5. Define co - efficient of thermal expansion.
6. Write general constitutive equation for anisotropic materials.
7. What are the basic strengthening mechanism(s) in HSLA steels?
8. What are the applications of Maraging steels?
9. What are the important strengthening mechanisms for polymers?
10. List the processing techniques for structural ceramics.

PART - B (5 x 14 = 70 Marks)

11. (a) Find principal stress if $\sigma_{11} = -1000$, $\sigma_{12} = 1250$ and $\sigma_{22} = 450$. Stresses are in MPa.

(14)

Or

(b) Find the invariants of hydrostatic and deviatoric tensor. (14)

12. (a) Write about the following:

(i) St. Venants theory of plastic flow. (7)

(ii) Prandtl – Reuss constitutive equation of plastic flow. (7)

Or

(b) Prove that at no condition difference between Von Mises and Tresca criteria exceeds about 15%. (14)

13. (a) Explain how Young's modulus in lateral and longitudinal direction is determined for a composite. (14)

Or

(b) Find an expression for coefficient of thermal expansion of fibre reinforced composite. (14)

14. (a) Write briefly about properties and applications of Dual phase steels. (14)

Or

(b) Write short notes on TRIP steels and also enumerate how it differs from Dual Phase steels. (14)

15. (a) Write briefly about characteristics and applications of any four engineering polymers. (14)

Or

(b) Explain slurry casting for processing of structural ceramic materials. (14)

PART - C (1 x 10 = 10 Marks)

16. (a) If the yield strength of steel is 950 MPa, determine whether yielding will have occurred on the basis of Von Mises and Tresca criteria. Given:

$\sigma_{11} = 200$, $\sigma_{22} = 100$, $\sigma_{33} = 50$ and $\sigma_{12} = 50$. The stresses are in MPa. (10)

Or

(b) A special state of stress prevails where $\sigma_{33} / \sigma_0 = 1/2$ and $\sigma_{13} = \sigma_{23} = 0$ and the other components of stress can vary arbitrarily. Find the value of V_1 , at yield, according to Tresca's yield criterion. (10)