CBCS Scheme

USN | | | | | | | | | | |

16/17MDE252

Second Semester M.Tech. Degree Examination, June/July 2018
Theory of Plasticity

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing one full question from each module.***

Module-1

1 a. Define octahedral stresses and derive the equations for effective stress. **(08 Marks)**

b. Explain the following :
   i) State of pure shear
   ii) Strain Rate tensor
   iii) Stress invariants
   iv) Spherical and Deviatorial strain tensors. **(08 Marks)**

OR

2 a. What is cubical Dilation and obtain its expressions in terms of linear strains. **(08 Marks)**

b. The displacement field for a body is given by $u = (x^2 + y)\,i + (3 + z)j + (x^2 + 2y)K$. Determine the principle strains at (3, 1, -2) and the directions of minimum principle strain. **(08 Marks)**

Module-2

3 a. Explain experimental verification of yield criteria using Taylor's and Quinney's experiment. **(08 Marks)**

b. Explain representing of traces of the yield surfaces in two dimensional stress space. **(08 Marks)**

OR

4 a. Explain yield criteria for an isotropic material. **(08 Marks)**

b. Explain Haigh – Westergaard stress space representation of yield criteria. **(08 Marks)**

Module-3

5 a. Derive the Prandtl – Reuss stress strain Relations for plastic flow. **(10 Marks)**

b. State and explain lower bound Theorem. **(06 Marks)**

OR

6 a. Explain the Saint Venant's Theory of plastic flow in detail. What are the limitations of this theory? **(10 Marks)**

b. Explain the following :
   i) Concept of plastic potential
   ii) The Levy – Lode variables **(06 Marks)**

Module-4

7 a. A cantilever beam of length L carries an end load W. Determine the deflection of the beam if stress – strain diagram for the material is represented by the equation $\sigma = H\epsilon^n$. **(08 Marks)**

b. A solid circular shaft of radius 120mm is required to transmit 600kW at 540rpm. The maximum torque is 30% greater than the mean torque if the shear stress strain curve for the shaft material is given by $\tau = 280\ \gamma^{0.25}$. Determine the maximum stress induced in the shaft and the corresponding angle of twist. What would be their values if the stress – strain curve is a linear one $G = 0.84 \times 10^5\ N/mm^2$? **(08 Marks)**

OR

8 a. Derive equations for draw stress in a strip drawing process considering friction. **(10 Marks)**

b. An aluminium rod 6.25mm in diameter is drawn into wires 5.60mm is diameter. The half die angle $\alpha = 10°6'$. Find the drawing stress considering friction if $\mu = 0.04$ and yield stress for aluminium $35N/mm^2$. Also calculate the maximum reduction possible. **(06 Marks)**

Module-5

9 a. List out the properties of slip lines. **(06 Marks)**

b. State and prove Hencky's first theorem. **(10 Marks)**

OR

10 a. What do you understand by a Hodograph? How a Hodographs can be drawn? **(08 Marks)**

b. Name different methods of construction of slip lines and explain any one. **(08 Marks)**

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