Printed pages: 02 Sub Code:MME205

Paper Id: 240205 Roll No: | | | | | | | | | | |

M. TECH.
(SEM-2) THEORY EXAMINATION 2017-18
ADVANCED MECHANICS OF SOLIDS

Time: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a. Explain body and surface force.
b. Define normal stress components
c. What do you mean by Fracture Toughness?
d. Write down the general expressions for stress distribution in a thick cylinder ?
e. What is strain energy of deformation?
f. State generalized Hooke's law?
g. State St. Venants principle for end effects with an example?
h. Write down boundary condition equations for stress analysis problem?
i. Give a Short note on Composite material.
j. List out three basic modes of failure.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. Given displacement field D.
D = [(x3+10) i + 3yzj + (z2-yx) k * 10-2m]
b. What is lame's Ellipsoid ? drive the equation for stress –director surface.
c. What are the stress deviator and its invariants? Explain

d. Derive the expression $\nabla^2\psi = 0$ for the symmetric section bar subjected to torsion where ψ (x, y) is the warpage function.
e. Give an overview of advantage and limitation of composite material.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) Show that Lame's ellipsoid and the stress-director surface together completely define the state of stress at a point.
(b) Consider the displacement field u = [$y^2i + 3yz + (4 - 6x^2)$ k] 10^{-2}. What are the rectangular strain components at the point P (1, 0, 2)? Use only liner terms.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) A cubic element is subjected to the following state of stress σ_x = 100MPa, σ_y = - 20 MPa, σ_z = - 40 MPa, $\tau_{xy} = \tau_{yz} = \tau_{zx} = 0$. Assuming the material to be homogeneous and isentropic, determine the principle shear strain and the octahedral Shear strain, if E= 2 x 10^5 MPa and v = 0.25.
(b) In uniaxial tensile test, yielding occurs at normal stress σ_o. If an element is subjected to plane state of stress in pure shear. Find out the value of shear stress

which would cause the failure according to (i) Tresca criterion (ii) Von-mises criterion.

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) Write all six compatibility equation. Given the following plane strain distribution.

(b) Write a short note on isotropy, anisotropy and orthotropy.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) What is the significance of calculating contact stresses when two bodies in contact. Explain

(b) What are the compatibility equations? Explain in detail

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) What do you mean by mean by torsion of circular and elliptical bars? What do you mean by membrane Analogy in torsion?

(b) Write note on (i) Viscoelasticity (ii) Fracture Mechanism