NOTE:- ANSWER FIVE EQUATIONS ONLY

Q1:

A- Choose the correct answer & State the reasons behind your choice: (12 mark)

1) The elastic strain obtained on applying a stress to a material is
   a. Time-dependent.
   b. Instantaneous.
   c. Partially permanent.
   d. reversible
   e. Directly proportional to the stress.
   f. inversely proportional to the stress

2) The elastic resilience of the material is
   a. The stored energy per unit volume during elastic deformation
   b. The stored energy per unit volume associated with dislocation
   c. Given by $1/2 \varepsilon^2 E$
   d. Given by $1/2 \sigma \varepsilon$
   e. Given by $E \delta / \delta t$, where $\sigma$, $\varepsilon$ and $E$ are stress, strain and Young modulus respectively

3) According to the Griffiths theory for brittle fracture, the stress required to propagate a crack is:
   a) Less than the ideal fracture stress.
   b) more than the ideal fracture stress
   c) Proportional to $a^{1/2}$ where $2a$ is the crack length
   d) Proportional to $a^{-1/2}$.
   e) proportional to $Y$ the surface energy
   f) Proportional to $Y^{1/2}$

4) The fracture resulted from tensile test, the fracture
   a) Is the brittle fracture.
   b) is the ductile fracture
   c) Depend on the material.
   d) probably started at a surface crack
   e) Is called a cup and con fracture

5) The fatigue resistance of the material is reduce by
   a. Permanent residual compressive stresses
   b. A mean positive (tensile) stress.
   c. = Chemically or mechanically $\sigma$ hardening the surface.
   d. Poor surface finishes.
   e. Noun of these.

B- You have simple mechanism subjected to tensile stress, How to avoid the fatigue failure? (12mark)

Q2):

A) Aluminum rod withstand applied force of 45000 pounds, the maximum allowable stress on the rod limited 25000 psi. the rod must be at least 150 inch long but deform elastically no more than 0.25 inch, when the force is applied calculate the true stress and true strain at 1)max load 2)at fracture
B) Define the following terms:

i. Thixotropic behavior.
ii. Class temp.
iii. Engineering stress

B) Name the major properties that could be taken from the tensile test curve?

Q3:
A. Explain the modes of the failures?
B. If some mechanism subjected to 1) repeated load 2) tensile load, what point should be taken into your consideration in view of design, manufacturing points?
C. What are the parameters that different types of fracture depend on?

Q4:

Q5:
A. A) Find the principle stresses in body under the stress state $\sigma_x=8, \sigma_y=6, \sigma_z=-4, \tau_{yz}=\tau_{zy}=5, \tau_{xz}=\tau_{zx}=-3, \tau_{xy}=\tau_{yx}=-8$ all stress in Mpa?
B. Explain briefly the deformation (elastic-plastic) deformation?
C. C) What are the questions that should be answered when study the fracture surface?

Q6) In each of the following sentences in questions below consists of an assertion followed by a reason .answer :

a) If both assertion and reason are true statements and the reason is correct explanation of the assertion.
b) Both assertion and reason are true statements but the reason is not correct explanation of the assertion.
c) If the assertion is true but the reason contains a false statement.
d) If the assertion is false but the reason contains a true statement.
e) If the both assertion and reason are false statements.
1. Elastic strain is directly proportional to the applied stress because force displacement curve is parabolic near to the equilibrium spacing.
2. in a tensile test the true stress is always greater than the engineering stress because the cross section area decreases.
3. specimens for impact test in are never notched because a notch introduces triaxial tensile stresses, which encourage a brittle fracture
4. All material have fatigue limit because fatigue cracks are never initiated at the surface.
5. Brittle materials are generally tested in comparison because barreling of the specimen in compression enhances necking.

(12mark)

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