

Unit 5 - Week 3

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Assignment 3

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-08-21, 23:59 IST.

Instructions for answering numerical questions

1. In all numerical type questions, you are expected to round off the answers to two decimal places accuracy unless otherwise specified.
 Examples: 1. Ans: 9.825, you report as 9.83
 2. Ans: 9.8, you report as 9.80
 3. Ans: 9, you report as 9.00
 This style of reporting is essential for computer based automated correction of your answers.

2. The answers for various quantities asked are to be reported in the following units unless otherwise specified, Stress- MPa, Stress Intensity Factor- MPa/m, Strain energy- Nmm, Energy release rate- J/m^2 , deflection - mm.

1) Mechanisms identified to cause stress corrosion cracking are 1 point

- A. Active path dissolution
- B. Hydrogen Embrittlement
- C. Film induced cleavage
- D. Creep

- A and D
- C and B
- A, B and C
- only D

No, the answer is incorrect. Score: 0
 Accepted Answers: A, B and C

2) Crack growth caused by combined influence of tensile stress and corrosive environment is 1 point

- Hydrogen embrittlement
- Corrosion fatigue
- Creep fatigue
- Stress corrosion cracking

No, the answer is incorrect. Score: 0
 Accepted Answers: Stress corrosion cracking

3) Stress corrosion cracking (SCC) can be prevented by 1 point

- A. Selection of appropriate material for corresponding environment
- B. Removal of chemical species that promotes cracking
- C. Change manufacturing process to reduce tensile stresses
- D. Periodic inspection and maintenance

- A, B
- A, B, C
- C, D
- A, B, C, D

No, the answer is incorrect. Score: 0
 Accepted Answers: A, B, C, D

4) Steel loses its ductility and strength due to 1 point

- Film induce cleavage
- Active path dissolution
- Hydrogen embrittlement
- None of the above

No, the answer is incorrect. Score: 0
 Accepted Answers: Hydrogen embrittlement

5) Crack formation due to coalescence of nucleated voids at microstructural inhomogeneity is a characteristic of which of the following mechanism? 1 point

- Creep
- Corrosion fatigue
- SCC
- Liquid metal embrittlement

No, the answer is incorrect. Score: 0
 Accepted Answers: Creep

6) Combined action of fatigue and Stress corrosion cracking causes 1 point

- Hydrogen embrittlement
- Corrosion fatigue
- Creep fatigue
- Stress corrosion cracking

No, the answer is incorrect. Score: 0
 Accepted Answers: Corrosion fatigue

7) The precursor for Liquid metal embrittlement is 1 point

- Cyclic loading
- Local chemical attack
- Surface flaws
- None of the above

No, the answer is incorrect. Score: 0
 Accepted Answers: Local chemical attack

8) After brittle fracture the facets of the specimen 1 point

- Are irregular
- Diffuses the incident light
- Is flat and reflects the incident light
- None of the above

No, the answer is incorrect. Score: 0
 Accepted Answers: Is flat and reflects the incident light

9) Match the following 1 point

- | | |
|------------------------------|---|
| A. Fatigue | I. Sustained static stress under aggressive environment |
| B. Stress corrosion cracking | II. Sustained static stress under high temperature |
| C. Creep | III. Cyclic Loading |

- A-III, B-I, C-II
- A-II, B-I, C-III
- A-II, B-III, C-I
- A-III, B-II, C-I

No, the answer is incorrect. Score: 0
 Accepted Answers: A-III, B-I, C-II

10) Which of the given materials has the highest surface energy 1 point

- Ice
- Aluminium
- Diamond
- Mild Steel

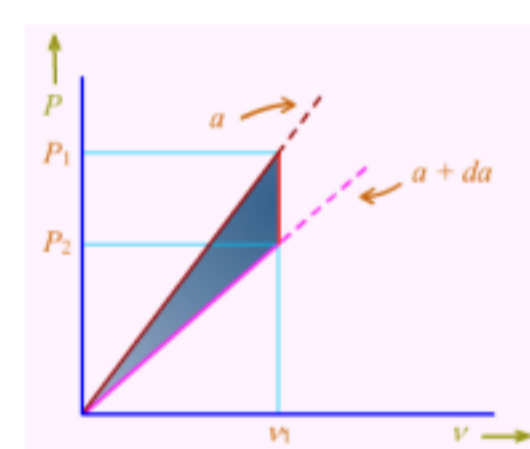
No, the answer is incorrect. Score: 0
 Accepted Answers: Diamond

11) Strain energy stored in a axially loaded member having a length L subjected to a load P is given by (A - cross section area and E- Young's Modulus) 1 point

-
- $U = \frac{1}{2} \int_0^L \frac{P}{AE} dx$
- $U = \frac{1}{2} \int_0^L \frac{P^2}{E} dx$
- $U = \frac{1}{2} \int_0^L \frac{P^2}{A} dx$
-
- $U = \frac{1}{2} \int_0^L \frac{P^2}{AE} dx$

No, the answer is incorrect. Score: 0
 Accepted Answers: $U = \frac{1}{2} \int_0^L \frac{P^2}{AE} dx$

12) Which of the following statement is true for the graph given in Figure? 2 points



- It is the Load-displacement curve under constant displacement showing energy availability for crack growth
-
- Change in strain energy is, $\Delta U = \frac{1}{2} v d P$
-
- External work done is, $W_{ext} = P d v$
- All the above

No, the answer is incorrect. Score: 0
 Accepted Answers: It is the Load-displacement curve under constant displacement showing energy availability for crack growth

Change in strain energy is, $\Delta U = \frac{1}{2} v d P$

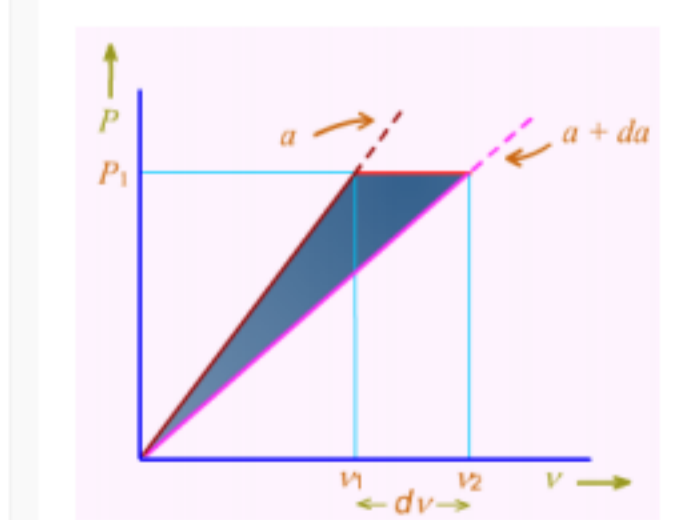
13) Match the following 2 points

- | | |
|----------------------------|---------------------------------|
| A. Brittle fracture | I. Along grain boundaries |
| B. Ductile fracture | II. Weak crystallographic plane |
| C. Trans granular fracture | III. Rupture |
| D. Intergranular fracture | IV. Cleavage |

- A-IV, B-III, C-II, D-I
- A-IV, B-II, C-III, D-I
- A-III, B-IV, C-II, C-I
- A-II, B-I, C-IV, D-III

No, the answer is incorrect. Score: 0
 Accepted Answers: A-IV, B-III, C-II, D-I

Consider the following load - displacement curve for the constant load case given in Fig. The crack grows from a to a + da with constant load P = 50 N. Initial displacement was 10 mm. The displacement corresponding to crack length a + da was found to be 20 mm. With this, calculate the following.



14) The change in strain energy is _____ N-mm.

No, the answer is incorrect. Score: 0
 Accepted Answers: (Type: Range) 245.00,255.00

15) Work done is _____ N-mm. 2 points

No, the answer is incorrect. Score: 0
 Accepted Answers: (Type: Range) 495.00,505.00

16) In case of a constant displacement condition, for the crack to grow from a to a+da the load 1 point

- increases
- decreases
- remains constant
- will not have any influence

No, the answer is incorrect. Score: 0
 Accepted Answers: decreases