# Unit 10 - Week 8



## Assignment 8

**The due date for submitting this assignment has passed.** **Due on 2019-09-25, 23:59 IST.**
**As per our records you have not submitted this assignment.**

**Instructions for answering numerical questions**

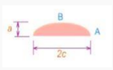
1. In all numerical type questions, you are expected to round off the answers to two decimal places accuracy unless otherwise specified.
   Examples: 1. Ans: 9.825, you report as 9.83
   2. Ans: 9.8, you report as 9.80
   3. Ans: 9, you report as 9.00
   This style of reporting is essential for computer 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$\sqrt{m}$, Strain energy- Nmm, Energy release rate- J/m$^2$ , deflection – mm,

1) In Fracture Mechanics, surface cracks are usually modeled as: *1 point*

- Circular cracks
- Line cracks
- Semi-elliptical cracks
- None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
*Semi-elliptical cracks*

2) For the semi-elliptical surface crack shown in the figure below, what is the value of stress intensity factor $K_I$ at the extreme end of the minor axis at $B$ (given $I_2$ is the elliptical integral) *1 point*




- $\frac{1.12\sigma\sqrt{\pi a}}{I_2}$
- $\frac{\sigma\sqrt{\pi a}}{I_2}$
- $\frac{\sigma\sqrt{\pi a}}{I_2}\left(\frac{a}{2c}\right)^{1/2}$
- $\frac{1.12\sigma\sqrt{\pi a}}{I_2}\left(\frac{a}{c}\right)^{1/2}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1.12\sigma\sqrt{\pi a}}{I_2}$

3) For surface cracks and corner cracks, the state of stress at the central zone of the crack front is: *1 point*

- uniaxial
- bi-axial
- tri-axial
- stress free state

No, the answer is incorrect.
Score: 0
Accepted Answers:
*tri-axial*

4) The stress intensity factor $K_I$ for embedded circular flaw is given by *1 point*

- $\frac{1}{\pi}\sigma\sqrt{\pi a}$
- $\frac{\sqrt{2}}{\pi}\sigma\sqrt{\pi a}$
- $\frac{2}{\pi}\sigma\sqrt{\pi a}$
- $\frac{1.12}{\pi}\sigma\sqrt{\pi a}$

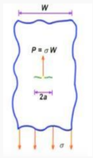
No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{2}{\pi}\sigma\sqrt{\pi a}$

5) Which of the following statements are true regarding surface cracks *2 points*

- A semi-elliptic surface crack is more dangerous than a through the thickness edge crack
- For a given loading and crack length, stress intensity factor for a semi-elliptic surface crack is more than that of a corner crack
- For deeper surface cracks, the back free surface correction factor can be reduced to one

No, the answer is incorrect.
Score: 0
Accepted Answers:
*A semi-elliptic surface crack is more dangerous than a through the thickness edge crack*
*For deeper surface cracks, the back free surface correction factor can be reduced to one*

6) Using the principle of super position, for the problem of a crack emanating from a riveted hole shown in the figure below, the $SIF$ can be found to be : *2 points*




- $\sigma\sqrt{\pi a}+\frac{\sigma w}{\sqrt{\pi a}}$
- $\frac{1}{2}\left(\sigma\sqrt{\pi a}+\frac{\sigma w}{\sqrt{\pi a}}\right)$
- $\sigma\sqrt{\pi a}+(1+w)$
- $\frac{\sigma\sqrt{\pi a}}{2}+(1+w)$

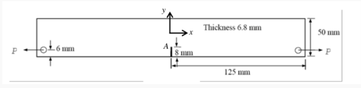
No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{2}\left(\sigma\sqrt{\pi a}+\frac{\sigma w}{\sqrt{\pi a}}\right)$

7) A small edge crack of length 2 mm is subjected to an internal pressure p = 35 MPa as shown in the figure. What is the $SIF$ (in $MPa(m)^{1/2}$) due to the pressure loading ?

No, the answer is incorrect.
Score: 0
Accepted Answers:
*(Type: Range) 2.50,4.00*

*2 points*

**Considering the figure, answer the questions that follows Q8-Q10. Take P as 2000 N.**




8) What is the $\sigma_y$ stress component experienced at the crack tip A (in MPa)?

No, the answer is incorrect.
Score: 0
Accepted Answers:
*(Type: Range) 13.00,16.00*

*2 points*

9) What is the $SIF$ for the given crack (in $MPa(m)^{1/2}$)

No, the answer is incorrect.
Score: 0
Accepted Answers:
*(Type: Range) 2.50,3.50*

*2 points*

10) What will be the $SIF$ value (in $MPa(m)^{1/2}$ ) if the equation for small edge crack is made use of?

No, the answer is incorrect.
Score: 0
Accepted Answers:
*(Type: Range) 2.00,4.00*

*1 point*

11) Following the method of superposition, a semi-infinite uncracked plate subjected to uniaxial loading is equivalent to which of the following configurations? *2 points*

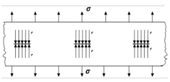



Fig. A

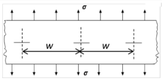



Fig. B

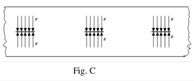


Fig. C

- Fig. A
- Fig. A + Fig. C
- Fig. B + Fig. C
- Fig. B - Fig. C

No, the answer is incorrect.
Score: 0
Accepted Answers:
*Fig. A*
*Fig. B + Fig. C*

12) If the $SIF$ for the configuration represented in Fig. D is K, then the $SIF$ for the problem represented in Fig. E is given by: *1 point*

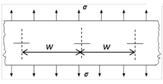



Fig. D

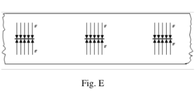


Fig. E

- K
- -K
- K/2
- -K/2

No, the answer is incorrect.
Score: 0
Accepted Answers:
*-K*

13) Making use of the above two problems, the $SIF$ of evenly spaced collinear cracks in an infinite strip subjected to internal pressure 'p' can be estimated as: *2 points*

- $K_I=-p\sqrt{\pi a}\left(\frac{w}{\pi a}\tan\frac{\pi a}{w}\right)^{\frac{1}{2}}$
- $K_I=p\sqrt{\pi a}\left(\frac{w}{\pi a}\tan\frac{\pi a}{w}\right)^{\frac{1}{2}}$
- $K_I=\frac{p}{2}\sqrt{\pi a}\left(\frac{w}{\pi a}\tan\frac{\pi a}{w}\right)^{\frac{1}{2}}$
- $K_I=\frac{-p}{2}\sqrt{\pi a}\left(\frac{w}{\pi a}\tan\frac{\pi a}{w}\right)^{\frac{1}{2}}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$K_I=p\sqrt{\pi a}\left(\frac{w}{\pi a}\tan\frac{\pi a}{w}\right)^{\frac{1}{2}}$