

Unit 4 - Week 2

Course outline

How to access the portal

Pre-Requisite Assignment

Week 1

Week 2

- LEFM and EPFM
- Fracture Mechanics is Holistic
- Fatigue Crack Growth Model
- Engineering Fracture Mechanics - Feedback for week 2
- Quiz : Assignment 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Week 11

Week 12

Video Download

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Assignment 2

The due date for submitting this assignment has passed. **Due on 2019-08-21, 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√m, Strain energy- Nmm, Energy release rate- J/m², deflection - mm,

1) Answer True or False for the following statement. The crack can propagate faster than Rayleigh wave speed in a solid. **1 point**

True
 False

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

2) Which of the following statements are true **1 point**

A. LEFM accounts only for small scale yielding near the crack tip
B. LEFM is suitable for analyzing ceramics at high temperature
C. Role of plastic deformation at the crack tip is accounted by EPFM
D. EPFM accounts only for small scale yielding near the crack tip

A and C
 B and D
 A and D
 ABCD

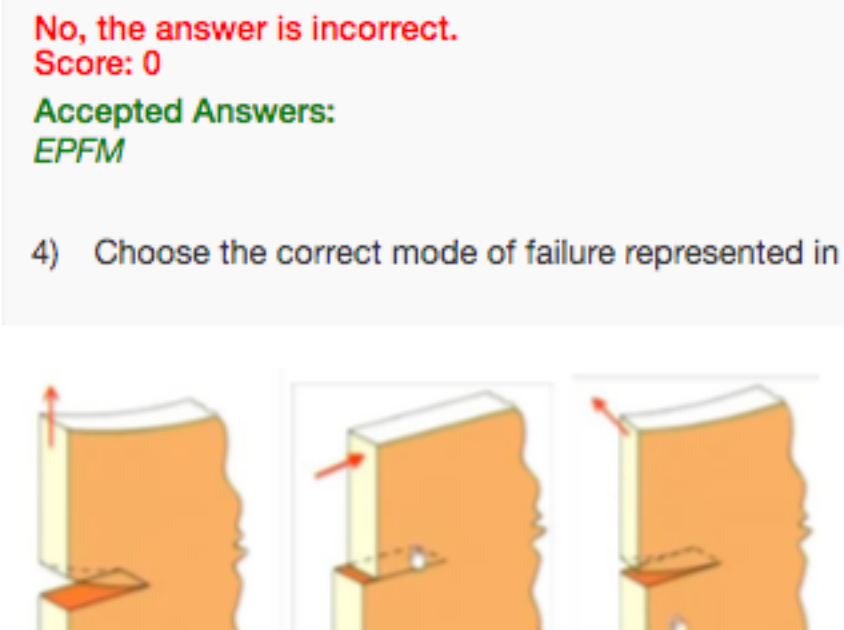
No, the answer is incorrect.
Score: 0
Accepted Answers: A and C

3) More ductile materials under plane stress or plane strain can be analyzed using which of the following category of fracture mechanics **1 point**

LEFM
 EPFM
 Plastic collapse
 None of the above

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

4) Choose the correct mode of failure represented in the figure. **1 point**



A-Mode III B-Mode-II C-Mode I
 A-Mode I B-Mode-III C-Mode II
 A-Mode I B-Mode-II C-Mode III
 A-Mode II B-Mode-I C-Mode III

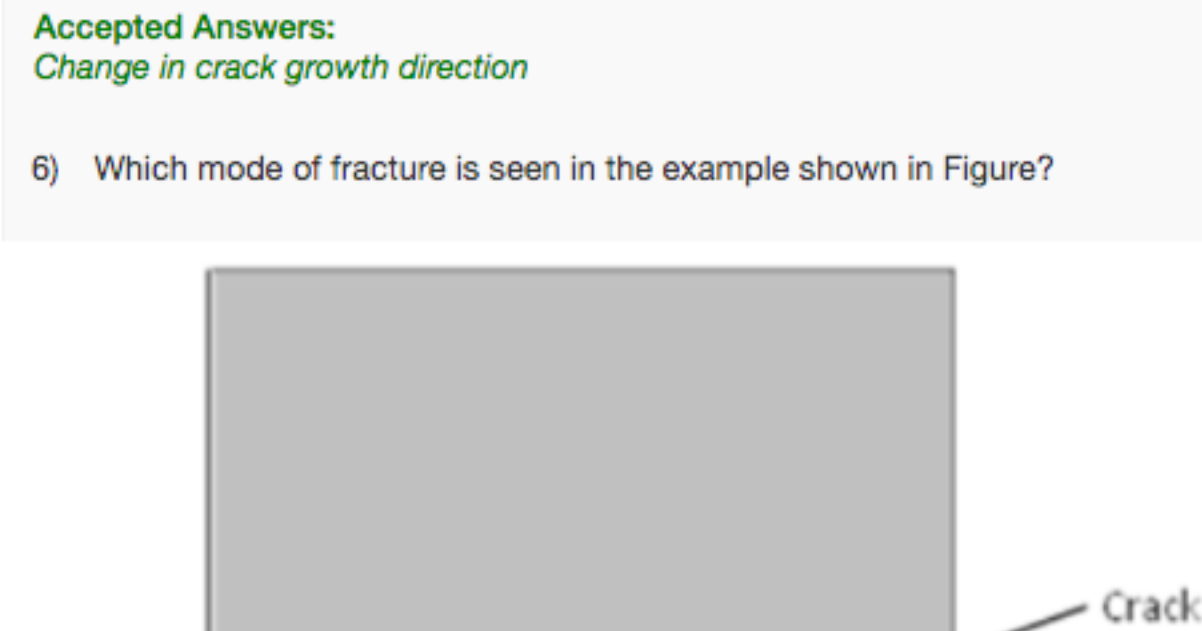
No, the answer is incorrect.
Score: 0
Accepted Answers: A-Mode I B-Mode-II C-Mode III

5) Mode II loading usually contributes to **1 point**

Change in crack growth direction
 Opening of the crack
 Tearing of the crack
 Speed of crack propagation

No, the answer is incorrect.
Score: 0
Accepted Answers: Change in crack growth direction

6) Which mode of fracture is seen in the example shown in Figure? **1 point**



Mode-I
 Mode-II
 Mode-III
 Mode-I and Mode-II
 Mode-I and Mode-III

No, the answer is incorrect.
Score: 0
Accepted Answers: Mode-II

7) Choose the correct statements regarding striations on fatigued cracked surface **1 point**

A. Identified near the crack tip at some point in time.
B. Form due to repeated blunting and sharpening of crack front
C. Visible to the naked eye.
D. They are always present on a fatigue crack surface.

B, C and D
 C and D
 A, B, C and D
 A and B

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

8) State the mode of loading at the crack tip for the configuration shown in Figure? **1 point**

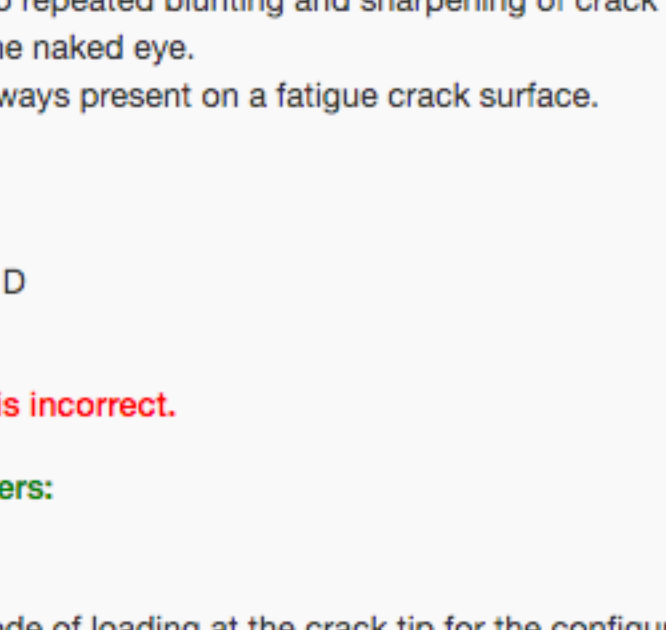


Fig. Plate with an inclined crack in tensile loading

Mode-I
 Mode-II
 Mode-III
 Mode-I and Mode-II
 Mode-I and Mode-III

No, the answer is incorrect.
Score: 0
Accepted Answers: Mode-I and Mode-II

9) Match appropriately **2 points**

- | | |
|---------|---|
| A. LEFM | a) Applications where material behavior is non-linear |
| B. EPFM | b) High strength steel |
| | c) Polymers below glass transition temperature |
| | d) Metals subjected to high temperature or high strain rate |
| | e) Ceramics at low temperatures |
- A-b,c,e B-a,d
 A-a,d B-b,c,e
 A-b,c,d B-d,e
 A-d,e B-b,c,d

No, the answer is incorrect.
Score: 0
Accepted Answers: A-b,c,d B-d,e

10) Given crack is subjected to opening mode in which loading conditions? **2 points**

-
-
-
-
-

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

-
-
-

11) Match the pairs **2 points**

- | | |
|------------------------------|------------------------|
| Parameters | Basis |
| 1. Energy Release Rate G_I | i. Stress based |
| 2. SIF K | ii. Energy based |
| 3. J-Integral J | iii. Strain based |
| 4. CTOD/COD | iv. Displacement based |
- 1-i, 2-ii, 3-i, 4-iv
 1-ii, 2-ii, 3-ii, 4-i
 1-i, 2-i, 3-i, 4-iv
 1-i, 2-i, 3-ii, 4-ii

No, the answer is incorrect.
Score: 0
Accepted Answers: 1-i, 2-i, 3-ii, 4-iv

State the mode of fracture for a thin tube under torsion having a through the thickness crack as shown in the Figure?

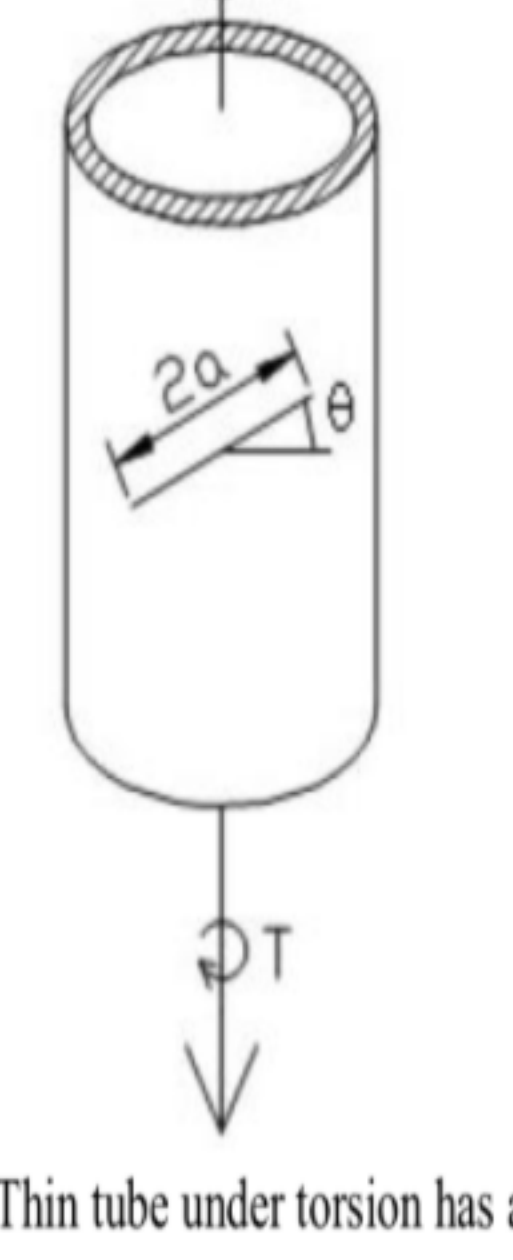


Fig. Thin tube under torsion has a through thickness crack

Based on above picture answer the following questions 12 & 13

12) When $\theta = 0^\circ$, the crack experiences **1 point**

Mode-I
 Mode-II
 Mode-III
 Mode-I and Mode-II
 Mode-I and Mode-III

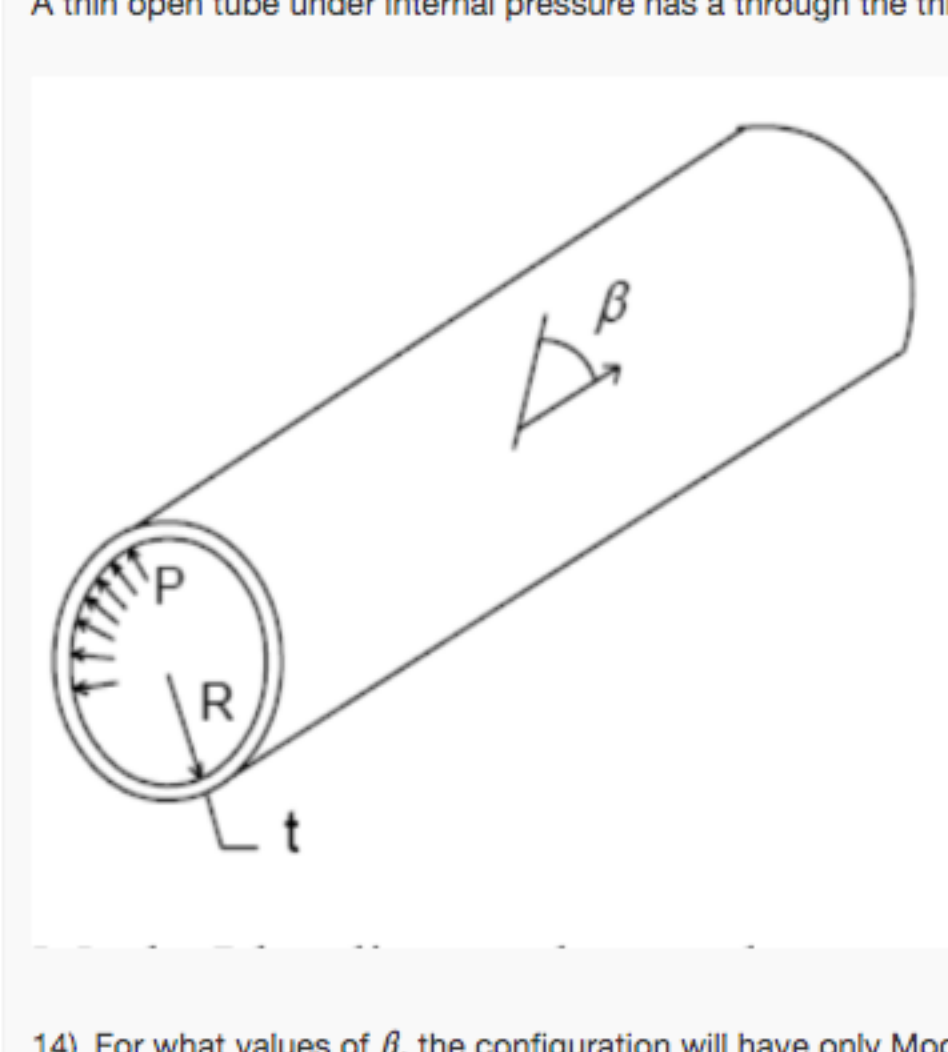
No, the answer is incorrect.
Score: 0
Accepted Answers: Mode-II

13) When $\theta = 45^\circ$, the crack experiences **1 point**

Mode-I
 Mode-II
 Mode-III
 Mode-I and Mode-II
 Mode-I and Mode-III

No, the answer is incorrect.
Score: 0
Accepted Answers: Mode-I

A thin open tube under internal pressure has a through the thickness crack as shown in Figure. Considering the Figure, answer the following questions 14 to 16



14) For what values of β , the configuration will have only Mode-I loading at the crack tip? **1 point**

0° and 45°
 45° and 60°
 0°
 None of the above

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

15) For what values of β , the configuration have only combined Mode-I and Mode-II loading at the crack tip? **2 points**

0° and 45°
 45° and 60°
 0° and 90°
 None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers: 45° and 60°

16) For what values of β , the configuration will have only Mode-III loading at the crack tip? **2 points**

0° and 45°
 45° and 60°
 0° and 90°
 None of the above

No, the answer is incorrect.
Score: 0
Accepted Answers: None of the above