Week 11: Assignment 11

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment.

Due on 2021-10-13, 23:59 IST.

1) Which type of overload is more effective in crack retardation during a fatigue crack-growth?
   - Reverse overload
   - Tensile overload
   - Both are equally effective
   - None of them have any effect on crack propagation

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

   2) Statement 1: During the tensile overload, the plastic zone size ahead of the crack tip is larger than that of the usual reversed cyclic tests.

   Statement 2: The formation of large plastic zone further decreases the stress intensity ahead of the crack tip.

   Statement 3: The tensile overload increases the fatigue life in case of both ductile and brittle material.

   Which one of these statements(s) is/are correct? (Multiple choices are correct)

   - Statement 1
   - Statement 2
   - Statement 3

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   Statement 1
   Statement 2

   3) Considering the statements mentioned in question 1, statement 1 is the correct explanation for statement 2.

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

   4) Assumption: The threshold stress intensity factor can be higher in corrosive environment.

   Reason: The corrosion product contributes to the crack closer effect by increasing the volume of material ahead of the crack tip.

   - Both assertion and reason are false.
   - Assertion is true but the reason is false.
   - Both assertion and reason are true, but reason is not the correct explanation of the assertion.
   - Both assertion and reason are true, and reason is the correct explanation of the assertion.

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   Both assertion and reason are true, and reason is the correct explanation of the assertion

   5) Assuming Basquin equation for 5K curve of microcrack and the values of fatigue strength exponent (correct up to two decimal). Fatigue data for uncracked specimens under axial stress, with zero mean stress is given below

<table>
<thead>
<tr>
<th>MPa</th>
<th>Nr cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>675</td>
<td>140000</td>
</tr>
<tr>
<td>563</td>
<td>165000</td>
</tr>
</tbody>
</table>

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (Type: Range) 0.20 - 0.37

   6) From the data given in question 5, find the value of fatigue strength coefficient (N) in MPa, (correct nearest integer).

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (Type: Range) 1170 - 1380

   7) A cylindrical steel bar is subjected to a fluctuating axial load varying from 225KN in tension to 175KN in compression. The mechanical properties of steel are $\sigma_y = 505$MPa, $\sigma_t = 615$MPa and $\kappa = 1.15$ (Determine the bar diameter in mm to give an ultimate fatigue life of 10^6 cycles, Goodman relation)

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   (Type: Range) 26.40

   8) Which of the following statements is incorrect?

   - J Integral is a fracture toughness criteria used in LEFM (Linear elastic fracture mechanics)
   - J Integral gives the variation in potential energy as a function of crack length
   - Value of J integral is equal to strain energy release rate
   - J Integral is path-independent

   No, the answer is incorrect.
   Score: 0
   Accepted Answers:
   J Integral is a fracture toughness criteria used in LEFM (Linear elastic fracture mechanics)

   9) A cylindrical steel pressure vessel with a wall thickness of 300 MPa is subjected to a hoop stress of 165MPa. A tensile residual stress of 85MPa. It can fail but can be assumed to be present. The internal service temperature of the vessel is 25°C, under which condition the $\sigma_{	ext{net}} = 140$MPa $\sigma_{	ext{net}}$. The vessel will be designed according to a "safe-design" philosophy in which a desirable leak will occur before the fracture could occur. The thickness of the pressure vessel based on fracture mechanics considerations should be

   - 10 mm
   - 13 mm
   - 15 mm
   - 18 mm

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