Assignment 7

The due date for submitting this assignment has passed. Due on 2018-09-19, 23:59 IST. As per our records you have not submitted this assignment.

1) If \( a_1, a_2 \) and \( a_3 \) denote the unit vectors of a 3D lattice, then the reciprocal lattice vector \( b_1 \) is given by:

\[
\begin{align*}
  b_1 &= 2\pi \frac{a_1 \times a_2}{a_1 \cdot (a_1 \times a_2)} \\
  b_1 &= 2\pi \frac{a_2 \times a_3}{a_2 \cdot (a_2 \times a_3)} \\
  b_1 &= 2\pi \frac{a_3 \times a_1}{a_3 \cdot (a_3 \times a_1)} \\
  b_1 &= 2\pi \frac{a_2 \times a_1}{a_2 \cdot (a_2 \times a_1)}
\end{align*}
\]

No, the answer is incorrect.

Score: 0

Accepted Answers:

\[
\frac{\partial^2}{\partial x^2}
\]

2) Consider a function \( g(x) \). The evaluation of the second derivative \( \frac{\partial^2}{\partial x^2} \) in the Fourier space would be: (\( \hat{g} \) is the Fourier transform of \( g \), \( k \) is the reciprocal lattice vector)

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3) When the diffusion equation is solved using Fourier transforms, the boundary condition that is implicitly assumed is:

- Dirichlet
- Neumann
- Robin
- Periodic

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

4) Stress acting on a material is a

- property tensor
- field tensor
- both (a) and (b)
- not a tensor

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

5) Diffusivity is a tensor with rank:

- zero
- one
- two
- four

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

6) The number of components in a tensor of rank 4 (in 3D space) is:

- 16
- 27
- 81
- 9

No, the answer is incorrect. Score: 0
Accepted Answers: 81

7) According to Einstein summation convention, the dummy index/indices in the equation \( y_{ij} = a_{ijkl} x_{kl} \) is/are:

- k
8) The number of times the transformation matrix is multiplied with a tensor to represent it in a new coordinate frame of reference is equal to the ________ of the tensor.

- trace
- determinant
- rank
- number of rows

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

9) The trace of an $n \times n$ anti-symmetric matrix is equal to

- $1$
- $-1$
- $0$
- $n^2$

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

10) According to Neumann principle, any property of a tetragonal crystal cannot have a

- spherical symmetry
- cubic symmetry
- hexagonal symmetry
- tetragonal symmetry

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

11) Which of the following options does not satisfy the definition of a group?

- ${1, 3, 5, 7}; \text{operation} = \text{multiplication modulo } 8$
- ${0, i, -i, 1}; \text{operation} = \text{multiplication}$
- ${0, \frac{\pi}{2}, \frac{3\pi}{2}}; \text{operation} = \text{addition modulo } 2\pi$
- ${1, i, -i, -1}; \text{operation} = \text{multiplication}$
In addition to the four conditions that define a group, that is, closure, associativity, identity and inverse, if an operation (*) on its elements also obeys \((a*b) = (b*a)\), then the group is called a/an ____________ group.
(Note: Please spell your answer correctly)