Assignment 10

Due on 2018-10-08, 23:59 IST

1. Transformation matrix is given by:
   \[
   \begin{bmatrix}
   x' \\
   y' \\
   z'
   \end{bmatrix} = \begin{bmatrix}
   a & b & c \\
   d & e & f \\
   g & h & i
   \end{bmatrix}
   \begin{bmatrix}
   x \\
   y \\
   z
   \end{bmatrix}
   
   \text{Answer:} x' = ax + by + cz, y' = dx + ey + fz, z' = gx + hy + iz.

2. For a large number of particles, pseudoscalar correlations, \( A \), is zero.
   \text{Answer:} Yes, Pseudoscalar correlations are zero.

3. The velocity fluctuation is in Fourier space is given by \( \tilde{u} \). \( \tilde{u} \) is not zero.
   \text{Answer:} No, \tilde{u} \text{ is not zero.}

4. In a periodic box, \( \tilde{u} \), consider the following frequency with a scalar of \( \tilde{u} = a \).

   \begin{align*}
   \tilde{u} &= \text{constant} \\
   \text{Answer:} \tilde{u} &= \text{constant}
   \end{align*}

5. For the flow described in S1, the total scalar energy for the flow is:
   \[ E_{\text{total scalar energy}} = \int E_{\text{scalar}} \text{d}V 
   \text{Answer:} \int E_{\text{scalar}} \text{d}V 
   \]

6. For the flow described in S2, the total scalar energy transferred by the model:
   \[ E_{\text{transferred by the model}} = \int E_{\text{transferred}} \text{d}V 
   \text{Answer:} \int E_{\text{transferred}} \text{d}V 
   \]

7. Consider a scalar, \( \phi = a \). The velocity fluctuation moves from one dimensional to two dimensional. \( \phi \) by the relation is:
   \[ \phi_{\text{new}} = \phi_{\text{old}} + \phi_{\text{fluctuation}} 
   \text{Answer:} \phi_{\text{new}} = \phi_{\text{old}} + \phi_{\text{fluctuation}} 
   \]

8. A plot of frequency spectrum is shown. Note: Note: No, it is not.
   \[ f_{\text{spectrum}} = \text{constant} 
   \text{Answer:} f_{\text{spectrum}} = \text{constant} 
   \]

9. The velocity fluctuation is in two-dimensional flow.
   \[ \text{Answer:} \text{No, it is not.} 
   \]

10. Choose the correct statement to describe scalar turbulence.
    \[ \text{Answer:} \text{Yes, correct statement.} 
    \]