Unit 5 - Week 3

Assignment 3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-08-21, 23:59 IST.

1) In Craya–Herring basis, basis vector $\hat{e}_3(\mathbf{k})$ is *1 point*

- $\hat{k}$
- $-\hat{k}$
- $\frac{\hat{k}\times\hat{n}}{|\hat{k}\times\hat{n}|}$
- $\hat{e}_2(\mathbf{k}) \times \hat{e}_1(\mathbf{k})$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\hat{k}$

2) In Craya–Herring basis, $\hat{e}_3(\mathbf{k}) \cdot \hat{e}_1(\mathbf{k})$ is *1 point*

- 0
- 1
- $\frac{1}{2}$
- 2

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

3) For an incompressible flow in three dimensions, $\mathbf{k} \cdot \mathbf{u}(\mathbf{k}) = 0$. Thus, in Craya–Herring basis, *1 point*

- $u_1(\mathbf{k}) = 0$
- $u_2(\mathbf{k}) = 0$
- $u_3(\mathbf{k}) = 0$
- $u_1(\mathbf{k}) \times u_3(\mathbf{k}) = 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$u_3(\mathbf{k}) = 0$

4) Under parity transformation, *1 point*

- modal energy and kinetic helicity remain unchanged
- modal energy changes and kinetic helicity remains unchanged
- modal energy remains unchanged and kinetic helicity changes
- none of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
modal energy and kinetic helicity remain unchanged

5) For a wavenumber triad $(\mathbf{k}', \mathbf{p}, \mathbf{q})$ with $\mathbf{k}' + \mathbf{p} + \mathbf{q} = 0$, $\hat{n}$ in Craya–Herring basis is *1 point*

- $\frac{\mathbf{q}\times\mathbf{p}}{|\mathbf{q}\times\mathbf{p}|}$
- $\frac{\mathbf{k}'\times\mathbf{p}}{|\mathbf{k}'\times\mathbf{p}|}$
- $\frac{\mathbf{q}\times\mathbf{k}'}{|\mathbf{q}\times\mathbf{k}'|}$
- $\hat{k}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{\mathbf{q}\times\mathbf{p}}{|\mathbf{q}\times\mathbf{p}|}$

6) A two-dimensional incompressible velocity field can be expressed as *1 point*

- $u(\mathbf{k}) = u_2(\mathbf{k})\hat{e}_1(\mathbf{k})$
- $u(\mathbf{k}) = u_1(\mathbf{k})\hat{e}_1(\mathbf{k})$
- $u(\mathbf{k}) = u_3(\mathbf{k})\hat{e}_2(\mathbf{k})$
- $u(\mathbf{k}) = u_3(\mathbf{k})\hat{e}_2(\mathbf{k})$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$u(\mathbf{k}) = u_1(\mathbf{k})\hat{e}_1(\mathbf{k})$

7) For an anticlockwise triad (described in the lectures), $\hat{e}_3(\mathbf{p}) \cdot \hat{e}_1(\mathbf{q})$ is *1 point*

- $-\cos\alpha$
- $\sin\alpha$
- $-\sin\alpha$
- 0

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

8) A mode $\mathbf{u}(\mathbf{k})$ is maximally helical if phase difference between $u_1(\mathbf{k})$ and $u_2(\mathbf{k})$ is [here $u_1(\mathbf{k})$ and $u_2(\mathbf{k})$ are the components of the mode along the basis vectors $\hat{e}_1(\mathbf{k})$ and $\hat{e}_2(\mathbf{k})$ in Craya–Herring basis] *1 point*

- $\pm\frac{\pi}{2}$
- $\pm\pi$
- 0
- $\pm\frac{3\pi}{2}$

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

9) For linear systems, pressure field will depend *1 point*

- both on nonlinear and forcing terms
- only on nonlinear term
- only on forcing term
- none of the above

No, the answer is incorrect.
Score: 0
Accepted Answers:
only on forcing term

10) Consider the following velocity field: *1 point*

$$\mathbf{u} = \hat{x}2\mathrm{B}\cos(y) + \hat{y}2\mathrm{C}\cos(x) + 4\mathrm{A}(\hat{x}\sin(x)\cos(y) - \hat{y}\cos(x)\sin(y)),$$

and the triad combination $(1, 0)$, $(0, 1)$ and $(1, 1)$. Using Craya–Herring basis and assuming forcing term is zero, $\dot{\mathrm{A}}$ is

- 0
- $-2\nu\mathrm{A}$
- $2\nu\mathrm{A}$
- $2\mathrm{A}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$-2\nu\mathrm{A}$