Week 4 Assignment

The due date for submitting this assignment has passed. **Due on 2017-09-07, 11:59 IST.**

Submitted assignment

1) A system (m equations) is hyperbolic at a point (x,t) for conservation law, if
- Jacobian matrix of flux term (m numbers) with respect to variables has real eigenvalues
- Jacobian matrix of flux term (m numbers) with respect to variables has linearly independent eigenvectors
- Jacobian matrix of flux term (m numbers) with respect to variables has linearly dependent eigenvectors

**No, the answer is incorrect.**
**Score: 0**
**Accepted Answers:**
- Jacobian matrix of flux term (m numbers) with respect to variables has real eigenvalues
- Jacobian matrix of flux term (m numbers) with respect to variables has linearly independent eigenvectors

2) Total Variation Diminishing (TVD) scheme is
- nonmonotonic
- monotonicity preserving method

**No, the answer is incorrect.**
**Score: 0**
**Accepted Answers:**
- monotonicity preserving method

3) Slope at $p^h$ cell in numerical flux calculation with high resolution methods for Fromm method can be calculated as,

$$
\sigma^p_n = \frac{g^n - g^n_0}{2\Delta x}
$$

No, the answer is incorrect.
**Score: 0**
**Accepted Answers:**
- $\sigma^p_n = \frac{g^n - g^n_0}{2\Delta x}$
4) Numerical flux function for Godunov method in case of one dimensional conservational law with flux term \( \mathcal{F}_\phi = a\phi \), \( \text{where } a = \text{constant}, a^+ = \max(a,0), a^- = \min(a,0) \) is

- \[ \tilde{F}_\phi(\phi_e(0)) = a^- \phi_E^n + a^+ \phi_P^n \]
- \[ \tilde{F}_\phi(\phi_e(0)) = a^- \phi_P^n + a^+ \phi_E^n \]
- \[ \tilde{F}_\phi(\phi_w(0)) = a^- \phi_P^n + a^+ \phi_W^n \]
- \[ \tilde{F}_\phi(\phi_w(0)) = a^- \phi_W^n + a^+ \phi_P^n \]

No, the answer is incorrect.
Score: 0
Accepted Answers:
- \[ \tilde{F}_\phi(\phi_e(0)) = a^- \phi_E^n + a^+ \phi_P^n \]
- \[ \tilde{F}_\phi(\phi_w(0)) = a^- \phi_W^n + a^+ \phi_P^n \]

5) Numerical flux function for upwind method in case of one dimensional conservational law with flux term \( \mathcal{F}_\phi = a\phi \) (where \( a = \text{constant} \)) is

- \[ \tilde{F}_\phi(\phi_p^n, \phi_E^n) = a\phi_E^n \text{ for } a < 0 \]
- \[ \tilde{F}_\phi(\phi_p^n, \phi_E^n) = a\phi_E^n \text{ for } a > 0 \]
- \[ \tilde{F}_\phi(\phi_P^n, \phi_W^n) = a\phi_P^n \text{ for } a < 0 \]
- \[ \tilde{F}_\phi(\phi_P^n, \phi_W^n) = a\phi_W^n \text{ for } a > 0 \]
- All of the above

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

6) Lax-Friedrichs scheme for one dimensional conservational law with flux term \( \mathcal{F}_\phi = a\phi \) (where \( a = \text{constant} \)) is

- Unconditionally stable
- Unconditionally unstable
- Conditionally stable
- Conditionally unstable

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

7) In Riemann problem, variable value

- is same on both sides of a face under consideration.
- is different on both sides of a face under consideration.

No, the answer is incorrect.
Score: 0
Accepted Answers:
is different on both sides of a face under consideration.

8) Partition of unity means

- Unconditionally stable
- Unconditionally unstable
- Conditionally stable
- Conditionally unstable

No, the answer is incorrect.
Score: 0
Accepted Answers:
is different on both sides of a face under consideration.

1 point
9) Polynomial basis of order 2 in one dimension contains

- \( 1 \times \)
- \( 1 \times x \)
- \( 1 \times x^2 \)
- \( x \times x \)
- \( 1 \times x^2 \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
- \( 1 \times x \times x^2 \)

10) In mesh-free method, node spacing \((d_c)\) in two-dimension depends on

- Volume of estimated support domain
- Area of estimated support domain
- Length of estimated support domain

No, the answer is incorrect.
Score: 0
Accepted Answers:
- Area of estimated support domain