Unit 12 - Week 9

Assignment 9

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

Due on 2019-10-02, 23:59 IST.

Instructions:
The objective of these questions is to assess your understanding of this week's content. You are not expected to memorize any of the questions, rather, you should derive the answers from first principles based on what you have learnt so far.

1) The FDTD update equation for dielectric material with conductivity σ is given by (where $\dot{E}$ is the time derivative of electric field): ***1 point***

- $\nabla \times H^{n-0.5} = \epsilon \dot{E}^{n-0.5} + \sigma E^{n-0.5}$
- $\nabla \times H^{n-0.5} = \epsilon \dot{E}^{n-0.5} - \sigma E^{n-0.5}$
- $\nabla \times H^{n} = \epsilon \dot{E}^{n-0.5} + \sigma E^{n-0.5}$
- $\nabla \times H^{n} = \epsilon \dot{E}^{n-0.5} - \sigma E^{n-0.5}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\nabla \times H^{n-0.5} = \epsilon \dot{E}^{n-0.5} + \sigma E^{n-0.5}$

2) In a 1-D lossy medium, a wave travels with a complex propagation constant $k = k_r + jk_i$. When it is incident on the end of the computational domain where an absorbing boundary condition is applied, the value of the reflection coefficient becomes zero under which of the following conditions: ***1 point***

- $k_r = \omega/c$
- $k_r = k_i$
- $k_i = \omega/c$
- Not possible

No, the answer is incorrect.
Score: 0
Accepted Answers:
Not possible

3) To correctly represent the current $J(t)$ with frequency $f_0 = 0.5$ Hz, the time discretization according to the Nyquist theorem should be ***1 point***

- $\Delta t \geq 0.5$
- $\Delta t \geq 1$
- $\Delta t < 0.5$
- $\Delta t < 1$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\Delta t < 1$

4) For a Gaussian current source with current $g(t) = exp(-((t - t_0)/t_w)^2)$ having width $t_w = 10$, what value of parameter t_0 is reasonable for smooth start to an FDTD simulation? ***1 point***

- $t_0 = 0$
- $t_0 = 5$
- $t_0 = 40$
- $t_0 = 200$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$t_0 = 40$

5) The FDTD update equation for a perfect electric conductor is given by ***1 point***

- $E^n = E^{n-1}$
- $E^n = -E^{n-1}$
- $E^n = E^{n-1} + \Delta t/\epsilon(\nabla \times H^{n-0.5})$
- $E^n = -E^{n-1} + \Delta t/\epsilon(\nabla \times H^{n-0.5})$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$E^n = -E^{n-1}$

6) Which combination of formulations introduces incident field at the boundary of object if the object is present in region-1 and the incident source is present in region-2? ***1 point***

- Region-1 : Scattered field , Region-2 : Total field
- Region-1 : Scattered field , Region-2 : Scattered field
- Region-1 : Total field , Region-2 : Total field
- Region-1 : Total field , Region-2 : Scattered field

No, the answer is incorrect.
Score: 0
Accepted Answers:
Region-1 : Total field , Region-2 : Scattered field

7) In which domain does the linear relation between the electric displacement D and the electric field E hold? ***1 point***

- Time domain
- Frequency domain
- both Time and Frequency domains
- None of the above

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

8) The absorbing boundary condition for 1D FDTD on the left boundary is given by: ***1 point***

- $\partial E/\partial x - 1/c \partial E/\partial t = 0$
- $\partial E/\partial x + 1/c \partial E/\partial t = 0$
- $1/c \partial^E/\partial x^2 - \partial E^2/\partial t^2 = 0$
- $\partial^2 E/\partial x^2 + 1/c^2 \partial E^2/\partial t^2 = 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\partial E/\partial x - 1/c \partial E/\partial t = 0$

9) Absoring boundary condition (ABC) is applied in 2D FDTD simulation to minimize reflection at normal incidence. What is the value of reflection coefficient at an angle of 60^o with the normal at the boundary? ***1 point***

- $-1/2$
- $1/2$
- $-1/3$
- $1/\sqrt{2}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$-1/3$

10) What happens when the value of electric field is initialized to zero on the boundary of a perfect electric conductor? ***1 point***

- It reaches a constant value (not zero) in infinite time
- It reaches a constant value (not zero) in finite time
- It stays at zero
- It varies arbitrarily

No, the answer is incorrect.
Score: 0
Accepted Answers:
It stays at zero