Unit 8 - Week 5

Assignment 5

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

Due on 2019-09-04, 23:59 IST.

1) In the presence of object with relative permittivity $\epsilon_r = 2$, Helmholtz equation in 2D E_z polarization, can be simplified to the form *1 point*

- $\nabla^2 E(r) + k_0^2(E(r) - E_i(r)) = -2k_0^2 E(r)$
- $\nabla^2 E(r) + k_0^2 E_i(r) = -2k_0^2 E(r)$
- $\nabla^2(E(r) - E_i(r)) + k_0^2 E(r) = -k_0^2 E(r)$
- $\nabla^2(E(r) - E_i(r)) + k_0^2(E(r) - E_i(r)) = -k_0^2 E(r)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\nabla^2(E(r) - E_i(r)) + k_0^2(E(r) - E_i(r)) = -k_0^2 E(r)$

2) Which of the following volume integral equations is a non-homogeneous Fredholm integral equation of the 2nd kind? *1 point*

- $\vec{E}(\vec{r}) - \vec{E}_i(\vec{r}) = \int_D g(\vec{r}, \vec{r}')k_0^2(\epsilon_r(\vec{r}') - 1)\vec{E}(\vec{r}')d\vec{r}'$
- $\vec{E}(\vec{r}) = \int_D g(\vec{r}, \vec{r}')k_0^2(\epsilon_r(\vec{r}') - 1)\vec{E}(\vec{r}')d\vec{r}'$
- $\vec{E}(\vec{r}) = \int_D g(\vec{r}, \vec{r}')k_0^2(\epsilon_r(\vec{r}') - 1)\vec{E}_i(\vec{r}')d\vec{r}'$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\vec{E}(\vec{r}) - \vec{E}_i(\vec{r}) = \int_D g(\vec{r}, \vec{r}')k_0^2(\epsilon_r(\vec{r}') - 1)\vec{E}(\vec{r}')d\vec{r}'$

3) While solving volume integral equation, the off-diagonal matrix elements($m \neq n$) of the matrix A in the equation $Ax = b$ are directly proportional to *1 point*

- $J_1(ka)H_0^2(k\rho_{mn})$
- $J_0(ka)H_0^2(k\rho_{mn})$
- $J_1(ka)H_1^2(k\rho_{mn})$
- $J_0(ka)H_1^2(k\rho_{mn})$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$J_1(ka)H_0^2(k\rho_{mn})$

4) The 2-D radar cross section (RCS) of an object, illuminated by an incident field E_i which is incident at an angle θ_i and observed at an angle θ, is given by *1 point*

- $\sigma(\theta, \theta_i) = \lim_{r\to 0} 2\pi r|E^s(r, \theta)|/|E^i(0, 0)|$
- $\sigma(\theta, \theta_i) = \lim_{r\to 0} 2\pi r|E^s(r, \theta)|^2/|E^i(0, 0)|^2$
- $\sigma(\theta, \theta_i) = \lim_{r\to \infty} 2\pi r|E^s(r, \theta)|/|E^i(0, 0)|$
- $\sigma(\theta, \theta_i) = \lim_{r\to \infty} 2\pi r|E^s(r, \theta)|^2/|E^i(0, 0)|^2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\sigma(\theta, \theta_i) = \lim_{r\to \infty} 2\pi r|E^s(r, \theta)|^2/|E^i(0, 0)|^2$

5) If $\vec{E}_n$ and $\vec{E}_{n-1}$ are the electric field at a point outside the object after solving integral equations using discretization n and $n-1$ respectively, then one of the criteria for achieving numerical convergence is given by *1 point*

- $(|\vec{E}_n - \vec{E}_{n-1}|) < \epsilon$
- $(|\vec{E}_n - \vec{E}_{n-1}|) > \epsilon$
- $|(|\vec{E}_n| - |\vec{E}_{n-1}|)| < \epsilon$
- $|(|\vec{E}_n| - |\vec{E}_{n-1}|)| > \epsilon$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$(|\vec{E}_n - \vec{E}_{n-1}|) < \epsilon$

6) Which of the following is true for scattering from an infinitely long z-directed cylinder with an arbitrary cross-section in the x-y plane that has been illuminated by a TM-polarized (E_z) field in a $2D$ setting (assume z-direction to be invariant)? *1 point*

- $E_z = 0$
- $H_z = 0$
- $E_x = E_y = 0$
- $H_x = H_y = 0$
- B and C
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
B and C

7) Solving the volume integral equation using method of moments leads to a system of equations in which number of equations is _____ the number of unknowns and the system of equations is _____. *1 point*

- equal to, sparse
- equal to, dense
- less than, under-determined
- more than, over-determined
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
equal to, dense

8) What is the key difference between integral equation and finite element methods? *1 point*

- Use of Green's function
- Computation Complexity
- Storage requirements
- All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above

9) In solving integral equations, which choice of testing functions leads to the point matching method, i.e $L\phi(r)|_{r=r_m} = f(r_m)$? *1 point*

- Delta functions
- cosine functions
- Pulse functions
- Gaussian functions

No, the answer is incorrect.
Score: 0

Accepted Answers:
Delta functions

10) If a linear operator L is defined by $L : d^2/dr^2 + 3d/dr + 7$ and $\phi(r) = 1/r^2 + 10$, then the value of the expression $L\phi(r)$ at $r = 1$ is _____.

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 77

1 point

11) Consider the first order Lagrange polynomials in one dimension, $N_1(x)$ and $N_2(x)$, defined in $1 \leq x \leq 3$. What is the value of the expression: $N_1(x)N_2(x) - \frac{dN_1}{dx}\frac{dN_2}{dx}$, at $x = 2$?

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.5

1 point