

Unit 6 - Week 3

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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) If $\mathbf{L}g(r, r') = \delta(r)$ and $\mathbf{L}\phi(r) = f(r)$, where $g(r, r') = r + r'^2$ and $f(r') = 1/r'$ then the value of $\phi(r)$ over the interval [1, 2] is given by: **1 point**

- $\phi(r) = 1.5 + r \ln 2$
 $\phi(r) = 3 + r \ln 2$
 $\phi(r) = 1.5 + r \ln 3$
 $\phi(r) = 3 + r \ln 3$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\phi(r) = 1.5 + r \ln 2$

2) For a string tied at both ends ($x = 0, x = l$) in which the displacement is governed by the differential equation $\nabla^2 u(x) = F(x)$, where F is a specified forcing function. The value of Green's function at $x = l/3$ and $x' = 3l/4$ is given by: **0 points**

- $l^2/6$
 $-l^2/9$
 $l/12$
 $-l/9$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $-l^2/9$

3) For the above question, if the force applied on the string is given by $F(x) = 1 \text{ N}$ for all points on the string of length 1 m, then the displacement $u(x)$ is given by: **0 points**

- $0.5(x^2 + x + 1)$
 $0.5(x^2 - x + 1)$
 $-0.5(x^2 + x + 1)$
 $-0.5(x^2 - x + 1)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $-0.5(x^2 - x + 1)$

4) What is the form of 2-D Green's function for scalar Helmholtz equation where the time convention is $\exp(-j\omega t)$? **1 point**

- $G(\vec{r}, \vec{r}') = -0.25J_0(k|\vec{r} - \vec{r}'|)$
 $G(\vec{r}, \vec{r}') = -0.25Y_0(k|\vec{r} - \vec{r}'|)$
 $G(\vec{r}, \vec{r}') = -0.25jH_0^{(1)}(k|\vec{r} - \vec{r}'|)$
 $G(\vec{r}, \vec{r}') = -0.25jH_0^{(2)}(k|\vec{r} - \vec{r}'|)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $G(\vec{r}, \vec{r}') = -0.25jH_0^{(1)}(k|\vec{r} - \vec{r}'|)$

5) What is the form of 3-D Green's function for scalar Helmholtz equation where the time convention is $e^{-j\omega t}$ and $R = |\vec{r} - \vec{r}'|$? **1 point**

- $G(R) = \frac{1}{4\pi R} \exp(jkR)$
 $G(R) = \frac{1}{4\pi R} \exp(-jkR)$
 $G(R) = \frac{1}{4\pi R^2} \exp(jkR)$
 $G(R) = \frac{1}{4\pi R^2} \exp(-jkR)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $G(R) = \frac{1}{4\pi R} \exp(jkR)$

6) Which of the following is true of a 1D Green's function, $g(x, x')$, in general? **1 point**

- continuous at $x = x'$
 discontinuous at $x = x'$
 derivative is continuous at $x = x'$
 derivative is discontinuous at $x = x'$
 Both A and D

No, the answer is incorrect.
Score: 0

Accepted Answers:
Both A and D

7) In a scattering problem when a bounded object is illuminated by an electromagnetic wave, which of the following theorems is used to express the field outside the object? **1 point**

- Huygens' Principle
 Extinction theorem
 Poynting's theorem
 Both A and C

No, the answer is incorrect.
Score: 0

Accepted Answers:
Huygens' Principle

8) In a scattering problem when a bounded object is illuminated by an electromagnetic wave, which of the following theorems is used to evaluate fields on the boundary of the object? **1 point**

- Huygens' Principle
 Extinction theorem
 Poynting's theorem
 Both A and C

No, the answer is incorrect.
Score: 0

Accepted Answers:
Extinction theorem

9) If ϕ is the electric field, \hat{n} is the outward normal to the surface, and \hat{t} is the unit vector in the tangential direction, then the tangential magnetic field \vec{H}_{tan} can be written as $\vec{H}_{\text{tan}} = \alpha(\nabla\phi \cdot \hat{n})\hat{t}$, where the value of α is **1 point**

- $-j\omega\mu_0$
 $j(\omega\mu_0)$
 -1
 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $j(\omega\mu_0)$

10) Why is $G(\rho) = \frac{-j}{4} H_0^{(2)}(k\rho)$ chosen as the Green's function in the 2D case, instead of $G(\rho) = \frac{-j}{4} H_0^{(1)}(k\rho)$? Assume the time convention is chosen as $\exp(j\omega t)$ **1 point**

- Because $H_0^{(2)}(k\rho)$ is an incoming wave at large ρ
 Because $H_0^{(2)}(k\rho)$ is an outgoing wave at large ρ
 We can choose either of them.
 None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
Because $H_0^{(2)}(k\rho)$ is an outgoing wave at large ρ