Unit 6 - 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) If $\mathrm{L}g(r,r') = \delta(r)$ and $\mathrm{L}\phi(r) = f(r)$, 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 $F(x) = 1\ N$ 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*

- $G(\vec{r},\vec{r}') = -0.25jJ_0(k|\vec{r}-\vec{r}'|)$
- $G(\vec{r},\vec{r}') = -0.25jY_0(k|\vec{r}-\vec{r}'|)$
- $G(\vec{r},\vec{r}') = -0.25jH_0^{(1)}(k|\vec{r}-\vec{r}'|)$
- $G(\vec{r},\vec{r}') = -0.25jH_0^{(2)}(k|\vec{r}-\vec{r}'|)$

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 $\vec{H}_{\tan} = \alpha(\nabla\phi.\hat{n})\hat{t}$, 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