

Question # 1 of 10 (Start time: 05:39:13 PM, 18 July 2023)

Consider the PDE $\frac{\partial f(x,t)}{\partial t} + c \frac{\partial f(x,t)}{\partial x} = 0$

which of the following difference approximation will be used to make upwind scheme when $c > 0$

Select the correct option

☐	Forward difference
☒	Backward difference
☐	Central difference
☐	Crank-Nicolson scheme

correct 100

Maths with Fatima Ali

Question # 2 of 10 (start time: 05:40:11 PM, 18 July 2023)

Total Marks: 1

Which of the following equation represents 2D Laplace partial differential equation?

Select the correct option

 Reload Math Equations

$\nabla u = 0$



$\nabla^2 u = 0$

correct 100

$\nabla u = f(x)$



$\nabla^2 u = f(x, y)$



Click to Save Answer & Move to Next Question

Maths with Fatima Ali 

Question # 3 of 10 (Start time: 05:41:50 PM, 18 July 2023)

Total Marks: 1

The discretized form of 2D Laplace PDE for the uniform grid spacing in both direction is given by the equation,

Select the correct option

 Reload Math Equations☐

$$4w_{i,j} = [(w_{i-1,j} + w_{i+1,j}) + (w_{i,j-1} + w_{i,j+1})] \quad \text{correct } \underline{100}$$

☐

$$w_{i,j} = 4[w_{i-1,j-1} + w_{i+1,j+1} + w_{i+1,j-1} + w_{i-1,j+1}]$$

☐

$$w_{i,j} = 4[(w_{i-1,j} + w_{i+1,j}) + (w_{i,j-1} + w_{i,j+1})]$$

☒

$$4w_{i,j} = [w_{i-1,j-1} + w_{i+1,j+1} + w_{i+1,j-1} + w_{i,j+1}]$$

Click to Save Answer & Move to Next Question

Question # 4 of 10 (Start time: 05:43:24 PM, 18 July 2023)

Total Marks: 1

The discretized form of 2D Laplace PDE when central difference approximation is applied on both derivatives with uniform step size h in both directions is

Select the correct option

 Reload Math Equations☐

$$4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = \frac{1}{4} f_{i,j}$$

☐

$$4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = 0$$
 correct 100

☐

$$4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = -4 f_{i,j}$$

☐

$$w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = 0$$

Maths with Fatima Ali 

Click to Save Answer & Move to Next Question

Question # 5 of 10 (Start time: 05:45:16 PM, 18 July 2023)

Total Marks: 1

Which of the following discretized factor is utilized to check the stability of finite difference scheme in Fourier transform,

Select the correct option

 Reload Math Equations☐

$$u_{i,j} = G^j e^{ik\Delta y}$$

☒

$$u_{i,j} = G^j e^{ikx}$$

correct 100☐

$$u_{i,j} = G^j e^{i\Delta x}$$

☐

$$u_{i,j} = G^i e^{ikx}$$

Click to Save Answer & Move to Next Question

Question # 6 of 10 (start time: 05:45:42 PM, 18 July 2023)

Total Marks: 1

Which of the following mathematical expression represents the standard five-point formula for 2D Laplace partial differential equation for the uniform step size in both x and y direction?

Select the correct option

 Reload Math Equations

$$u_{i,j} = 4[u_{i-1,j} + u_{i+1,j} + u_{i,j-1} + u_{i,j+1}]$$



$$u_{i,j} = \frac{1}{4}[u_{i-1,j-1} + u_{i+1,j+1} + u_{i+1,j-1} + u_{i-1,j+1}]$$



$$u_{i,j} = \frac{1}{4}[u_{i-1,j} + u_{i+1,j} + u_{i,j-1} + u_{i,j+1}]$$
 correct 100



$$u_{i,j} = 4[u_{i-1,j-1} + u_{i+1,j+1} + u_{i+1,j-1} + u_{i-1,j+1}]$$

Maths with Fatima Ali  Saving...

MTH646 – Partial Differential Equations (Quiz#1)

Question # 7 of 10 (**Start time: 05:47:07 PM, 18 July 2023**)

Gauss-Seidel method is also known as..... Method.

Select the correct option

☐	Jacobi's iterative
☒	Successive displacement
☐	Gauss Jordan
☐	Gauss elimination

correct 100

Maths with Fatima Ali 

Question # 8 of 10 (Start time: 05:48:27 PM, 18 July 2023)

Total Marks: 1

Consider the mesh point $w_l = w_{i,j}$ of the solution domain
where l denotes the labeling to the internal grid points and $l =$

Select the correct option

From Example 25

 Reload Math Equations

- | | |
|----------------------------------|--------------------------|
| ☐ | $i + (m + 1 + j)(n - 1)$ |
| ☐ | $i + (n - 1 - j)(m - 1)$ |
| ☒ | $i + (m - 1 - j)(n - 1)$ |
| ☐ | $j + (m - 1 - i)(n - 1)$ |
- correct 100

Maths with Fatima Ali

Click to Save Answer & Move to Next Question

Question # 10 of 10 (Start time: 05:50:08 PM, 18 July 2023)

Total Marks: 1

Which of the following mathematical expression represents the rotated five-point formula for 2D Laplace partial differential equation for the uniform step size in both x and y direction?

Lecture No.29



Select the correct option



$$u_{t,j} = 4[u_{t-1,j} + u_{t+1,j} + u_{t,j-1} + u_{t,j+1}]$$



$$u_{t,j} = \frac{1}{4}[u_{t-1,j-1} + u_{t+1,j+1} + u_{t+1,j-1} + u_{t-1,j+1}]$$

correct 100

$$u_{i,j} = \frac{1}{4}[u_{i-1,j} + u_{i+1,j} + u_{i,j-1} + u_{i,j+1}]$$



$$u_{i,j} = 4[u_{i-1,j-1} + u_{i+1,j+1} + u_{i+1,j-1} + u_{i-1,j+1}]$$

Maths with Fatima Ali  Click to Save Answer & Move to Next Question

Question # 9 of 10 (start time: 05:49:14 PM, 18 July 2023)

Total Marks: 1

The discretized form of 2D Laplace PDE for the nonuniform grid spacing in both direction is given by the equation,

From Example No.25

Select the correct option

 Reload Math Equations



$$2\left(\frac{h^2}{k^2} + 1\right)w_{i,j} = [(w_{i-1,j} + w_{i+1,j}) + (w_{i,j-1} + w_{i,j+1})] \quad \text{correct } \underline{100}$$



$$2\left(\frac{h^2}{k^2} - 1\right)w_{i,j} = [w_{i-1,j-1} + w_{i+1,j+1} + w_{i+1,j-1} + w_{i-1,j+1}]$$



$$4\left(\frac{h^2}{k^2} - 1\right)w_{i,j} = [w_{i-1,j-1} + w_{i+1,j+1} + w_{i+1,j-1} + w_{i-1,j+1}]$$



$$4\left(\frac{h^2}{k^2} + 1\right)w_{i,j} = [(w_{i-1,j} + w_{i+1,j}) + (w_{i,j-1} + w_{i,j+1})]$$

Click to Save Answer & Move to Next Question

Maths with Fatima Ali 

Question # 3 of 10 (Start time: 08:27:03 PM, 18 July 2023)

Total Marks: 1

A finite difference method when applied on PDE will be stable if the amplification factor G is

Select the correct option



Reload Math Equations

correct 100

☐

Bounded

☐

Unbounded

☐

None of these

☐

Unrestrained

Maths with Fatima Ali

[Click to Save Answer & Move to Next Question](#)

Question # 4 of 10 (start time: 08:28:07 PM, 18 July 2023)

Total Marks: 1

The discretized form of 2D Laplace PDE for the nonuniform grid spacing in both direction is given by the equation,

Select the correct option

Reload Math Equations



$$4\left(\frac{h^2}{k^2} + 1\right)w_{i,j} = [(w_{i-1,j} + w_{i+1,j}) + (w_{i,j-1} + w_{i,j+1})]$$



$$2\left(\frac{h^2}{k^2} - 1\right)w_{i,j} = [w_{i-1,j-1} + w_{i+1,j+1} + w_{i+1,j-1} + w_{i-1,j+1}]$$



$$2\left(\frac{h^2}{k^2} + 1\right)w_{i,j} = [(w_{i-1,j} + w_{i+1,j}) + (w_{i,j-1} + w_{i,j+1})]$$
 correct 100



$$4\left(\frac{h^2}{k^2} - 1\right)w_{i,j} = [w_{i-1,j-1} + w_{i+1,j+1} + w_{i+1,j-1} + w_{i-1,j+1}]$$

Click to Save Answer & Move to Next Question

Question # 7 of 10 (**Start time: 08:28:48 PM, 18 July 2023**)

Consider the PDE $\frac{\partial f(x,t)}{\partial t} + c \frac{\partial f(x,t)}{\partial x} = 0$

which of the following difference approximation will be used to make upwind scheme when $c < 0$

Select the correct option

☐	Central difference
☒	Forward difference
☐	Crank-Nicolson scheme
☐	Backward difference

correct 100

Maths with Fatima Ali



Question # 8 of 10 (**Start time: 08:29:17 PM, 18 July 2023**)

The Crank-Nicolson scheme when applied on heat diffusion equation is

Select the correct option

☐	Conditionally stable
☐	None of these
☐	Neither stable nor bounded
☒	Unconditionally stable

correct 100

Maths with Fatima Ali

Question # 9 of 10 (Start time: 08:30:06 PM, 18 July 2023)

Total Marks: 1

Which of the following mathematical expression represents the rotated five-point formula for 2D Laplace partial differential equation for the uniform step size in both x and y direction?

Select the correct option

 Reload Math Equations


$$u_{i,j} = \frac{1}{4} [u_{i-1,j-1} + u_{i+1,j+1} + u_{i+1,j-1} + u_{i-1,j+1}]$$

correct 100

$$u_{i,j} = 4[u_{i-1,j} + u_{i+1,j} + u_{i,j-1} + u_{i,j+1}]$$



$$u_{i,j} = \frac{1}{4} [u_{i-1,j} + u_{i+1,j} + u_{i,j-1} + u_{i,j+1}]$$



$$u_{i,j} = 4[u_{i-1,j-1} + u_{i+1,j+1} + u_{i+1,j-1} + u_{i-1,j+1}]$$

Maths with Fatima Ali 

Click to Save Answer & Move to Next Question

Question # 3 of 10 (Start time: 08:34:20 PM, 18 July 2023)

Total Marks: 1

The discretized form of 2D Laplace PDE when central difference approximation is applied on both derivatives with uniform step size h in both directions is

Select the correct option

 Reload Math Equations

☐ $4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = -4 f_{i,j}$

☐ $4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = \frac{1}{4} f_{i,j}$

☐ $w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = 0$

☒ $4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = 0$

correct 100

Click to Save Answer & Move to Next Question

Question # 4 of 10 (**Start time: 08:34:59 PM, 18 July 2023**)

Fourier analysis method is used to find the of finite difference scheme.

Select the correct option

☒	Stability correct 100
☐	Convergence
☐	Consistency
☐	None of these

Maths with Fatima Ali 

Question # 5 of 10 (start time: 08:36:07 PM, 18 July 2023)

Total Marks: 1

A finite difference scheme will be stable if the amplification factor G satisfied the following condition,

Select the correct option

 Reload Math Equations

$|G| < 1$



$|G| \leq 1$

correct 100

$|G| = 1$



$|G| \geq 1$

Maths with Fatima Ali 

Click to Save Answer & Move to Next Question

Question # 7 of 10 (start time: 08:38:17 PM, 18 July 2023)

Total Marks: 1

The discretized form of 2D Poisson PDE when central difference approximation is applied on both derivatives with uniform step size $h=0.5$ in both directions is

Select the correct option

 Reload Math Equations

☐ $4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = -\frac{1}{4} f_{i,j}$ correct 100

☐ $4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = -4 f_{i,j}$

☐ $4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = -f_{i,j}$

☒ $4w_{i,j} - (w_{i-1,j} + w_{i+1,j}) - (w_{i,j-1} + w_{i,j+1}) = \frac{1}{4} f_{i,j}$

Maths with Fatima Ali 

 Click to Save Answer & Move to Next Question

Question # 10 of 10 (Start time: 08:40:09 PM, 18 July 2023)

Total Marks: 1

Which of the following mathematical expression represents the standard five-point formula for 2D Laplace partial differential equation for the uniform step size in both x and y direction?

Select the correct option



$$u_{i,j} = 4[u_{i-1,j} + u_{i+1,j} + u_{i,j-1} + u_{i,j+1}]$$



$$u_{i,j} = 4[u_{i-1,j-1} + u_{i+1,j+1} + u_{i+1,j-1} + u_{i-1,j+1}]$$



$$u_{i,j} = \frac{1}{4}[u_{i-1,j} + u_{i+1,j} + u_{i,j-1} + u_{i,j+1}]$$
 correct 100



$$u_{i,j} = \frac{1}{4}[u_{i-1,j-1} + u_{i+1,j+1} + u_{i+1,j-1} + u_{i-1,j+1}]$$

Maths with Fatima Ali 

Click to Save Answer & Move to Next Question

Question # 7 of 10 (Start time: 11:38:21 AM, 19 July 2023)

Total Marks: 1

Which of the following PDE generates first order upwind scheme after applying appropriate difference approximations and $c > 0$

Select the correct option

 Relcoed Math Equations☐

$$\frac{\partial f(x,t)}{\partial t} + c \frac{\partial^2 f(x,t)}{\partial x^2} = 0$$

☐

$$\frac{\partial f(x,t)}{\partial t} + c \frac{\partial f(x,t)}{\partial x} = 0$$

correct 100☐

$$\frac{\partial f(x,t)}{\partial t} - c \frac{\partial f(x,t)}{\partial x} = 0$$

☐

$$\frac{\partial f(x,t)}{\partial t} = c \frac{\partial^2 f(x,t)}{\partial x^2}$$

Maths with Fatima Ali 

Click to Save Answer & Move to Next Question

Question # 9 of 10 (Start time: 11:35:56 AM, 19 July 2023)

Total Marks: 1

Which of the following equation represents 2D Poisson partial differential equation?

Select the correct option

 Reload Math Equations

$$\nabla^2 u = f(x, y) \quad \text{correct } \underline{\underline{100}}$$



$$\nabla u = f(x)$$



$$\nabla^2 u = 0$$



$$\nabla u = 0$$

Maths with Fatima Ali 

Click to Save Answer & Move to Next Question

Question # 6 of 10 (start time: 11:34:04 AM, 19 July 2023)

Total Marks: 1

Laplace partial differential equation is a type of..... partial equation.

Select the correct option



Reload Math Equations



Parabolic



None of these



Elliptical



Hyperbolic

correct 100**Maths with Fatima Ali**