Unit 6 - Week 4: Elliptic Equations

Assignment 4

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

Due on 2020-02-26, 23:59 IST.

1) The five point formula for discretizing $\frac{\partial^2\phi}{\partial x^2} + \frac{\partial^2\phi}{\partial y^2} = 0$ using a uniform step size is *1 point*

- $\phi_{i+1,j} + \phi_{i-1,j} - 2\phi_{i,j} + \phi_{i,j+1} + \phi_{i,j-1} = 0$
- $\phi_{i+1,j} + \phi_{i-1,j} - 3\phi_{i,j} + \phi_{i,j+1} + \phi_{i,j-1} = 0$
- $\phi_{i+1,j} + \phi_{i-1,j} - 4\phi_{i,j} + \phi_{i,j+1} + \phi_{i,j-1} = 0$
- $\phi_{i+1,j} + \phi_{i-1,j} - 5\phi_{i,j} + \phi_{i,j+1} + \phi_{i,j-1} = 0$

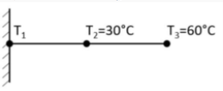
No, the answer is incorrect.
Score: 0
Accepted Answers:
$\phi_{i+1,j} + \phi_{i-1,j} - 4\phi_{i,j} + \phi_{i,j+1} + \phi_{i,j-1} = 0$

2) The discretized equation for $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{q'''}{k} = 0$ with $\Gamma = \left(\frac{\Delta y}{\Delta x}\right)^2$ is *1 point*

- $\Gamma T_{i+1,j} + \Gamma T_{i-1,j} + T_{i,j+1} + T_{i,j-1} + \Delta x^2 \frac{q'''}{k} = 2(\Gamma + 1) T_{i,j}$
- $T_{i+1,j} + T_{i-1,j} + \Gamma T_{i,j+1} + \Gamma T_{i,j-1} + \Delta x^2 \frac{q'''}{k} = 2(\Gamma + 1) T_{i,j}$
- $T_{i+1,j} + T_{i-1,j} + \Gamma T_{i,j+1} + \Gamma T_{i,j-1} + \Delta y^2 \frac{q'''}{k} = 2(\Gamma + 1) T_{i,j}$
- $\Gamma T_{i+1,j} + \Gamma T_{i-1,j} + T_{i,j+1} + T_{i,j-1} + \Delta y^2 \frac{q'''}{k} = 2(\Gamma + 1) T_{i,j}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\Gamma T_{i+1,j} + \Gamma T_{i-1,j} + T_{i,j+1} + T_{i,j-1} + \Delta y^2 \frac{q'''}{k} = 2(\Gamma + 1) T_{i,j}$

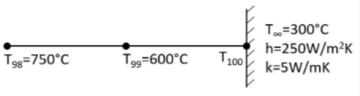
3) The value of T_1, with left boundary as adiabatic and grid size of 0.10, using the values of T_2 and T_3 is _____°C.



No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 20

1 point

4) For a constant grid size of 0.12, the value of T_{100} using the values of T_{98} and T_{99} for the given mixed boundary condition, is _____°C.



No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 350

1 point

5) The optimum value of relaxation factor $\omega_{opt} = \frac{2-\sqrt{1-a}}{a}$ is valid for any domain. *1 point*

- True
- False

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

6) TDMA gives result in less iterations as compared to Gauss-Seidel. *1 point*

- True
- False

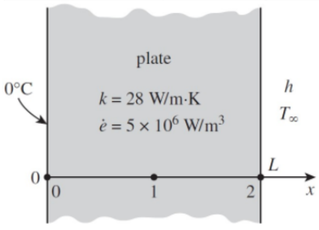
No, the answer is incorrect.
Score: 0
Accepted Answers:
True

7) If heat flux is specified at a boundary, it is a Dirichlet boundary condition. *1 point*

- True
- False

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

8) Consider a large plate of thickness L = 4 cm in which heat is generated uniformly at a constant rate, $\dot{e}$ .One side of the plate is maintained at 0°C by iced water while the other side is subjected to convection to an environment at T_∞= 30°C with a heat transfer coefficient of h = 45 W/m^{2}K. Considering a total of three equally spaced nodes in the medium, two at the boundaries and one at the middle, the exposed surface temperature of the plate under steady conditions is _____°C.



No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 130,145

1 point