

Quiz # 1 (Full marks: 20)

Time: 20 minutes

Sep 14, 2020

1. Complete the table by filling the blank cells

6

Mode	Mechanism	Empirical Equation (Law)	Transport Property in SI units
	Energy transfer due to molecular/atomic activity	$Q = -kA \frac{dT}{dx}$ (Fourier's Law)	
Convection	Energy transfer due to molecular motion and bulk fluid motion		
	Energy transfer due to exchange of electromagnetic waves		Emissivity ϵ [-]

2. What are the conditions of applicability of the following equation?

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} + \frac{\dot{e}_{gen}}{k} = \frac{1}{\alpha} \frac{\partial T}{\partial t}$$

3

2. What are the conditions of applicability of the following equation?

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} + \frac{\dot{e}_{gen}}{k} = \frac{1}{\alpha} \frac{\partial T}{\partial t}$$

3

Conditions:

3. The thermal diffusivity, α is/has (Tick the most appropriate choice)

1

- a) the measure of heat diffusion through a medium
- b) called heat propagation velocity
- c) defined by $k/\rho c_p$
- d) the dimension of m^2/s in SI system
- e) All of the above

3. The thermal diffusivity, α is/has (Tick the most appropriate choice)
- the measure of heat diffusion through a medium
 - called heat propagation velocity
 - defined by $k/\rho c_p$
 - the dimension of m^2/s in SI system
 - All of the above

4. The heat conduction equation in a medium is given by:

$$r \frac{d^2 T}{dr^2} + 2 \frac{dT}{dr} = 0$$

Conditions of its applicability are:

Items	Alternatives	Correct answer
Geometry	Plane wall/ Cylinder/ Sphere	
Dimension	1D/ 2D/ 3D	
Thermal condition	Transient/ Steady State	
Heat Generation	Yes/ No	

5. Write three statements on thermal resistance.

6. Write the mathematical model of heat transfer scenario shown in the figure. Also mention about the assumptions.

