ASSIGNMENT - 1

QUESTION-1

1.1 Picture a scenario where you place a pot of water on a heated stove. As the water starts to boil, discuss the primary mode of heat transfer responsible for heating the water. Is it conduction, convection, or radiation? Provide reasons for your choice.

1.2 Imagine you are holding a metal rod over a flame, and after some time, you feel the other end of the rod getting hot. Explain the heat transfer mechanism involved in this situation and identify whether it is conduction, convection, or radiation. Justify your answer

QUESTION-2

Consider heat loss from a 200-L cylindrical hot water tank in a house to the surrounding medium. Would you consider this to be a steady or transient heat transfer problem? Also, would you consider this heat transfer problem to be one-, two-, or three-dimensional? Explain.

QUESTION-3

Starting with an energy balance on a cylindrical shell volume element, derive the steady one-dimensional heat conduction equation for a long cylinder with constant thermal conductivity in which heat is generated at a rate of **g** and indicate what each variable represents.

QUESTION-4

Consider a medium in which the heat conduction equation is given in its simplest form.

$$\frac{\partial^2 T}{\partial x^2} = \frac{1}{\alpha}\frac{\partial T}{\partial t}$$

(a) Is heat transfer steady or transient?
(b) Is heat transfer one-, two-, or three-dimensional?
(c) Is there heat generation in the medium?
(d) Is the thermal conductivity of the medium constant or variable?

QUESTION-5

Consider a large, 3-cm-thick stainless steel plate in which heat is generated uniformly at a rate of 5 x 10^6 W/m3 . Assuming the plate is losing heat from both sides, determine the heat flux on the surface of the plate during steady operation.