**INDIAN INSTITUTE OF TECHNOLOGY . IIT KANPUR**

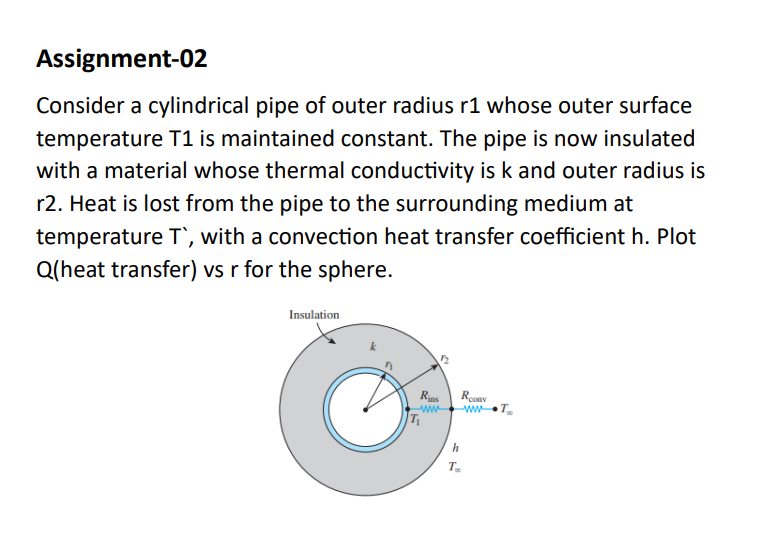


**ANALYSING HEAT TRANSFER**

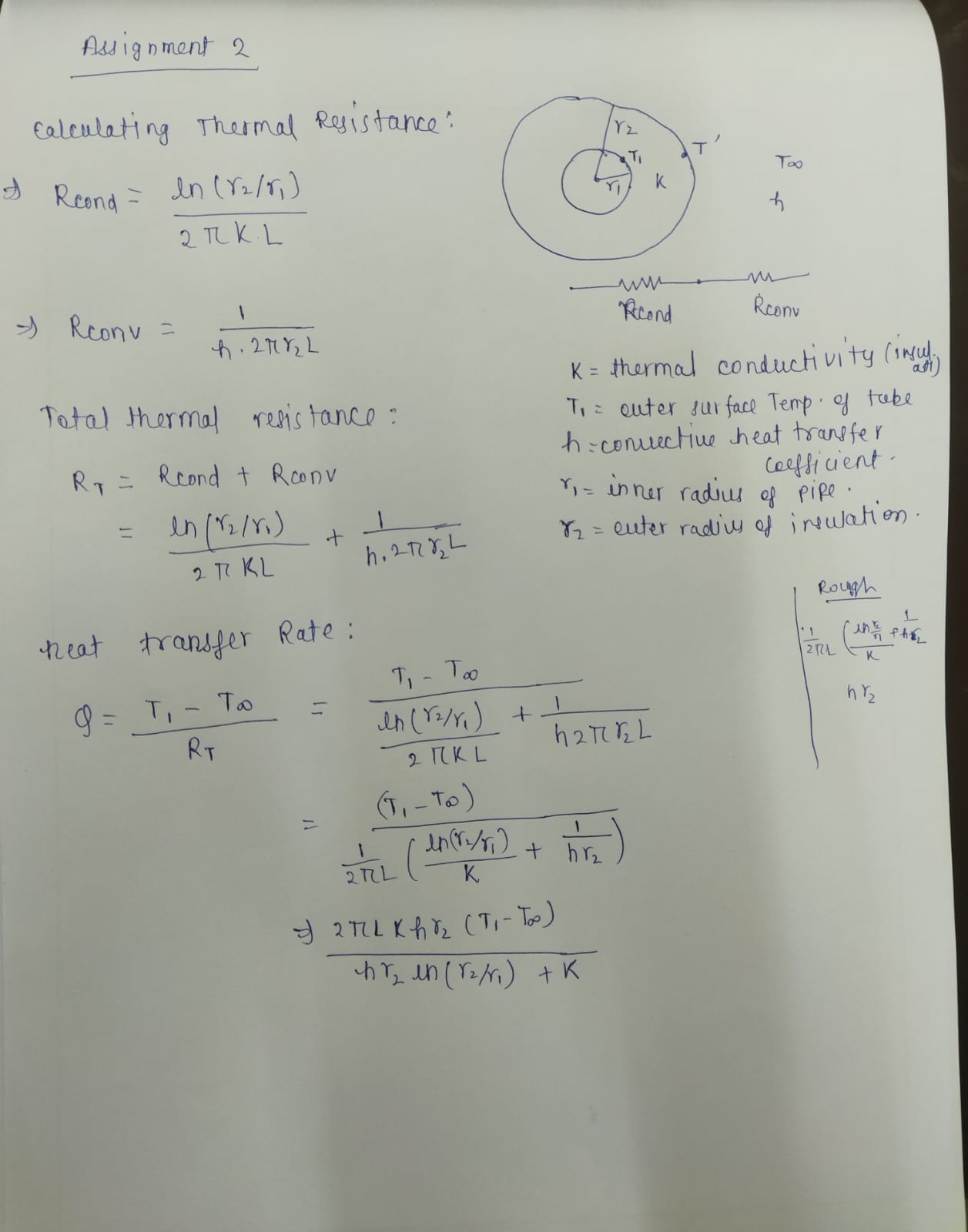
**AJAY SINGH (220090)**

**Assignment : 2**

QUESTION :



**SOLUTION:**



CODE AND GRAPHS(Q vs R):

1.for cylinder:

% Given parameters

T1 = 100; % Outer surface temperature of the pipe (constant) in °C

T\_infinity = 25; % Temperature of the surrounding medium in °C

k = 0.1; % Thermal conductivity of the insulation material in W/(m·K)

h = 10; % Convection heat transfer coefficient in W/(m^2·K)

r1 = 0.02; % Inner radius of the pipe in meters

L = 1; % Length of the pipe in meters

% Create an array of radii from r1 to r2

r\_values = linspace(r1, 0.05, 100); % Outer radius of the insulation layer

% Calculate the thermal resistances

R\_cond = log(r\_values / r1) ./ (2 \* pi \* k \* L); % Element-wise division

R\_conv = 1 ./ (h \* 2 \* pi \* r\_values \* L); % Element-wise division

% Calculate the total thermal resistance

R\_total = R\_cond + R\_conv;

% Calculate the heat transfer Q

Q = (T1 - T\_infinity) ./ R\_total; % Element-wise division

% Plot Q vs. r

plot(r\_values, Q);

xlabel('Radius (m)');

ylabel('Heat Transfer (W)');

title('Heat Transfer vs. Radius for cylindrical pipe');

grid on;

1.for sphere:

% Given parameters

T1 = 100; % Outer surface temperature of the sphere (constant) in °C

T\_infinity = 25; % Temperature of the surrounding medium in °C

k = 0.1; % Thermal conductivity of the insulation material in W/(m·K)

h = 10; % Convection heat transfer coefficient in W/(m^2·K)

r1 = 0.02; % Inner radius of the sphere in meters

% Create an array of radii from r1 to r2

r\_values = linspace(r1, 0.05, 100); % Outer radius of the insulation layer

% Calculate the thermal resistances

R\_cond = (r\_values-r1) ./ (4 \* pi \*r1.\*r\_values\* k); % Element-wise division

R\_conv = 1 ./ (h \* 4 \* pi \* r\_values.^2 ); % Element-wise division

% Calculate the total thermal resistance

R\_total = R\_cond + R\_conv;

% Calculate the heat transfer Q

Q = (T1 - T\_infinity) ./ R\_total; % Element-wise division

% Plot Q vs. r

plot(r\_values, Q);

xlabel('Radius (m)');

ylabel('Heat Transfer (W)');

title('Heat Transfer vs. Radius for sphere');

grid on;



