EXPERIMENT 5

AIM

Write a program to solve a second order differential equation using the method of variation of parameter.Use it to solve the differential equation $d^2y/dx^2 + 4y = secx$

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THEORY:

Start with the General Solution

On Introduction to Second Order Differential Equations we learn how to find the general solution.

Basically we take the equation

$$\frac{d^2y}{dx^2} + p\frac{dy}{dx} + qy = 0$$

and reduce it to the "characteristic equation":

$$r^2 + pr + q = 0$$

The Particular Solution

Using the Wronskian we can now find the particular solution of the differential equation

$$\frac{d^2y}{dx^2} + p\frac{dy}{dx} + qy = f(x)$$

using the formula:

$$y_p(x) = -y_1(x)\int \frac{y_2(x)f(x)}{W(y_1, y_2)}dx + y_2(x)\int \frac{y_1(x)f(x)}{W(y_1, y_2)}dx$$

SOURCE CODE

```
clear all;
close all;
syms y(x) R(x) % function D2y + 4y = sec(x)
```

```
R = sec(x);%non-homogeneous part


% Declaring Constants
c1= 'C1';
c2= 'C2';


%equn= m^2+4=0, m=+-2i
%c.f. = C1sin2x + C2cos2x;
syms y1(x) y2(x)
y1 = sin(2*x);
y2 = cos(2*x);
yconst=[y1 y2]; %vector to show the y functions


%finding Wronskain
W_matrix(x)=[yconst; diff(yconst)];
W(x)= det(W_matrix);


%function u,v such that yp= ucosx + vsinx
syms u(x) v(x)


u = int(-1*y2*R/W);
v = int(y1*R/W);


%solution
ySolution = c1*sin(2*x) + c2*cos(2*x) + u*cos(x) + v*sin(x);
disp(ySolution)
```

OUTPUT:

```
var_parameters
var_parameters


ySolution(x) =


cos(x)*sin(x) - cos(x)*(atanh(sin(x))/2 - sin(x)) + C2*cos(2*x) + C1*sin(2*x)
```