NAME :- LOKESHWAR. ANCHURI BRANCH :- CSE
ROLLNO :- 18K41A0538
SUBJECT :- NEURAL NETWORKS AND DEEP LEARNING

ASSIGNMENT - 1

Q:- Find global minimum point and the value for function $f(x) = x^4 + 3x^2 + 10$.

Sol:- * Manual Calculations for two iterations :-

Given $f(x) = x^4 + 3x^2 + 10$.

Step-1 :- Initialize Variables

$x = 1$
$\eta = 0.1$
epoches = 2
itr = 1.

Step-2 :- First order derivative of $f(x)$ at $x = 1$

$$\left(\frac{\partial f}{\partial x}\right)_{x=1} = (4x^3 + 6x)$$

sub $x = 1$.

$= 4(1)^3 + 6(1)$
$= 4 + 6$
$= 10.$

Step-3 :- Calculate change in x.

$\Delta x = -\eta\left(\frac{\partial f}{\partial x}\right)$
$= (-0.1)(10)$
$\Delta x = -1.$

Step-4 :- Update Variable x

$x = x + \Delta x$
$= 1 + (-1)$
$x = 0.$

Step-5 :- Increment iterations

itr = itr + 1

Step-6 :- if (itr > epoches) then goto step-7
else, go to step-2

here, itr = 2, epoches = 2

$2 > 2 \rightarrow$ It is false

Hence goto step-2.

Step-2 :- Calculate first order derivative of $f(x)$ at $x = 0$

$$\left(\frac{\partial f}{\partial x}\right)_{x=0} = (4x^3 + 6x)_0$$
$$= 4(0)^3 + 6(0)$$
$$= 0$$

Step-3 :- Calculate change in x.

$$\Delta x = -\eta\left(\frac{\partial f}{\partial x}\right)$$
$$= -(0.1)\,0$$
$$= 0$$

Step-4 :- Update variable x

$$x = x + \Delta x$$
$$= 0 + 4(0)$$
$$= 0$$

Step-5 :- Increment iterations

itr = itr + 1

Step-6 :- if (itr > epoches) goto step-7
else, go to step-2

here, itr = 3, epoches = 2

$3 > 2 \rightarrow$ It is true

Hence goto step-7.

Step-7 :- Print Variable x

$\Rightarrow x = 0$

at $x = 0$

We find minimum value of function $f(x)$, that minimum value.

$f(0) = 10.$